

TAXONOMY OF *CRICOTOPUS* SPECIES (DIPTERA: CHIRONOMIDAE) FROM SALEM CREEK, ONTARIO

by

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Abstract

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Eleven species of *Cricotopus* collected in Salem Creek, Southern Ontario are described on the basis of imagines (I), pupae (P), and larvae (L), where possible. These are: *C. annulator* Goetghebuer (I), *C. bicinctus* (Meigen) (IPL), *C. festivellus* (Kieffer) (IP), *C. infuscatus* (Malloch) (IPL), *C. politus* (Coquillett) (IPL), *C. sylvestris* (Fabricius) (IPL), *C. slossonae* Malloch (IPL), *C. triannulatus* (Macquart) (IPL), *C. trifascia* Edwards (IPL), *C. varipes* Coquillett (IPL) and *C. luciae* n. sp. (I). Three names are placed in synonymy: *C. exilis* Johannsen for *C. triannulatus* (Macquart), *C. irwini* Sublette & Sublette for *C. annulator* Goetghebuer and *C. ithacanensis* Sublette for *C. trifascia* Edwards. It is suggested that *C. politus* and *C. luciae* each be placed in new species groups. Descriptions and illustrations of the most important features are given, plus a short account of the known distribution, the status of each species and the type material of Nearctic species treated here.

Resumé

On donne la description de onze espèces de *Cricotopus* rencontrées à Salem Creek sud Ontario en utilisant autant que possible les imagos (I), les pupes (P) et les larves (L). Ce sont: *C. annulator* Goetghebuer (I), *C. bicinctus* (Meigen) (IPL), *C. festivellus* (Kieffer) (IP), *C. infuscatus* (Malloch) (IPL), *C. politus* (Coquillett) (IPL), *C. sylvestris* (Fabricius) (IPL), *C. slossonae* Malloch (IPL), *C. triannulatus* (Macquart) (IPL), *C. trifascia* Edwards (IPL), *C. varipes* Coquillett (IPL), et *C. luciae* n. sp. (I). Trois noms sont placés en synonymie: *C. exilis* Johannsen pour *C. triannulatus* (Macquart), *C. irwini* Sublette & Sublette pour *C. annulator* Goetghebuer et *C. ithacanensis* Sublette pour *C. trifascia* Edwards. On suggère de créer deux nouveaux groupes d'espèces pour *C. politus* et *C. luciae*. La description de chaque espèce est accompagnée de l'illustration des caractères importants, plus un court exposé sur la distribution connue, son statut taxonomique et enfin sur le matériel type des espèces néarctiques décrites ici.

Introduction

Hirvenoja (1973) suggested that the genus *Cricotopus* and its nearest relatives (*Acricotopus* Kieffer, *Paratrichocladius* Santos Abreu, *Paracladius* Hirvenoja and *Halocladus* Hirvenoja) form a strictly monophyletic group. Imagos of the genus *Cricotopus* are readily distinguished from other Orthoclaadiinae by the following characters: eyes hairy, dorsocentral setae short and adpressed, anterior notopleural setae usually absent, sensilla chaetica rarely absent on mid and hind legs. abdomen with interspersed white and dark segment in most species and usually with a median, white band on fore femora. The larva has a "seta interna" on the mandible and the premandibular brush is either reduced or absent, the labral setae, SI, are bifurcate and the paralaial beard is absent. The lateral setae on abdominal segments I-VIII are usually in the form of a setal brush. When

abdominal setal brushes are absent, larvae of *Cricotopus* (*Cricotopus*) are hardly distinguishable from those of *Orthocladius* (*Orthocladius*). In the pupa, the patches of spines on the abdominal tergites are either fused or separated from each other; the frontal setae are generally present but when absent there is no patch of spines on abdominal tergites VII-VIII; the prothoracic horn is very rarely absent.

The genus has a world-wide distribution (Hirvenoja 1973). In North America it is known from the Arctic (Oliver 1962) to the southern United States (Sublette and Sublette 1971; Beck and Beck 1959). It occupies a wide variety of aquatic habitats with greatly differing water qualities (Curry 1965; Roback 1974; Beck 1977).

The aim of this paper was to provide a taxonomic basis for an ecological study on *Cricotopus* in Salem Creek, 15 km north of Waterloo, southern Ontario. A thorough revision of Nearctic species is needed but, as this would involve years of work, the scope of this study has been limited to describing the larvae, pupae and adults, whenever possible, of twelve species encountered in this stream. It is hoped that these descriptions of common southern Ontario species will form a useful reference for further, more extensive taxonomic and ecological studies on these important freshwater insects.

A full description of these species, using Hirvenoja's (1973) format, has been produced as part of a Ph.D. thesis (LeSage 1979). This included numerous measurements and counts of a number of structures, which proved to have overlapping ranges of variation between species. Examples of these are: the chaetotaxy of the head, the length of segments of the palps, the length of segments of the legs, the lateral coloration of the thorax, the chaetotaxy of the thorax, the haltere, etc. These have all been omitted from this paper but are available from the thesis.

A detailed list of collector's localities, as presently recorded in the literature is not included as most species are probably widespread in North America and some identifications are in doubt.

Historical Review of Nearctic Species

Say (1823) recognized the first Nearctic species of *Cricotopus* (as *Chironomus geminatus*) and by 1965 Sublette and Sublette catalogued 33 species for North America. Most descriptions were based on the adults, either males (Packard 1869; Coquillett 1902; Malloch 1915; Wirth 1957), females (Johannsen 1905; Malloch 1915; Walley 1928; Dendy & Sublette 1959), both sexes (Malloch 1915; Curran 1929; Roback 1957b), or adults associated with their immature stages (Johannsen 1905, 1942, 1943; Roback 1957a; Wirth 1957). Thirteen additional references referred to European literature.

Johannsen (1937) divided the genus into three groups but the four groups suggested by Roback (1957a), based on features of immatures, are defined better and represent natural assemblages. Ten years later, Sublette (1966a,b, 1967a,b, 1970) redescribed the type specimens of North American chironomids and also described two new species from the *Cricotopus* type material. Meanwhile, Saether (1967) detailed the characteristics of a larva referred to as *C. glacialis* Edw. from Ella Island, Northwest Territories. Bath & Anderson (1969) described an unnamed *Cricotopus* larva from California. Saether (1971) reared two unusual species in which the males bore female-like antennae and had projecting scuta.

An historical highpoint in *Cricotopus* taxonomy and chironomid knowledge in general was the publication of a monumental monograph on European *Crico-*

topus and related genera by Hirvenoja (1973). This work provided a solid base for future revision of the genus in other regions of the world, and contained keys, descriptions and illustrations of all known adults, males and females, as well as pupae and larvae.

The Nearctic fauna is in need of a similar revision. Meanwhile, descriptions of individual species continue to appear; the latest being that of *C. mackenziensis*, a new species closely related to *C. bicinctus*, from the Northwest Territories by Oliver (1977).

Materials and Methods

This study is based primarily on the examination of approximately 400 slide-mounted individuals, and over 15,000 specimens, preserved in alcohol, collected at Salem Creek, and from surrounding areas. The type-material was mounted in Canada balsam according to a technique used at the Biosystematics Research Institute (Roussel 1978), non-type material was dissected and mounted directly from alcohol in polyvinyl-lactophenol.

Figures were drawn with the aid of a drawing tube. Only those portions of the female genitalia which previous authors had found useful were drawn; namely, the lateral sternites IX, the coxosternapodemes, the spermathecae and the spermathecal ducts (see Saether 1977, for discussion on female genitalia). Counts and measurements were made normally on the right side of the animal and the values reported as means followed by ranges in brackets following Hirvenoja's (1973) format. Length of leg segments, wing length, and other dimensions were measured with a calibrated ocular micrometer (Soponis, 1977). Generally, ten specimens were used for counts and measurements but supplementary specimens were dissected and mounted to check on variation. Although these specimens were not included in measurements, they were sometimes employed for illustrations.

The origin of nearly all the material was Salem Creek in southern Ontario, an enriched alkaline and well oxygenated stream, running on a very hard cobble-pebble-gravel-sand substratum, encrusted by marl deposits (LeSage and Harrison 1980). Unless stated otherwise, all the specimens were collected or reared by the first author.

Terminology and Nomenclature

Terms used in the present study follow essentially those of Hirvenoja (1973) to whom the reader is referred for a complete discussion; however, the thoracic sclerites are named according to Hansen & Cook (1976). The term "sensilla chaetica" corresponds to the "*Sinneszapfen*" of Hirvenoja (1973). The following ratios are used in descriptions:

Antennal ratio = length of antennomeres 1-12/length of antennomere 13
(adult male)

Hypostomial ratio = length of hypostomium/width hypostomium (larva)
(Fig. 1)

Prothoracic horn ratio = length prothoracic horn/width prothoracic horn
(pupa)

In the adults, the abdominal tergal chaetotaxy was most reliable on tergites III-IV and therefore only the setal pattern on these tergites is reported here.

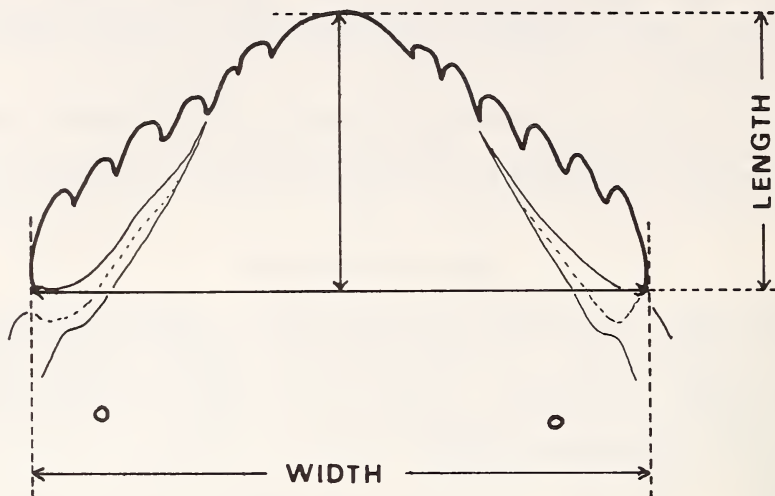


FIG. 1. Hypostomium (larva) showing derivation of hypostomium ratio. Length, from the base of 6th lateral tooth to the tip of median tooth. Width, maximum distance between the two, 6th lateral teeth.

Hirvenoja (1973) divided the genus *Cricotopus* into two subgenera: *Cricotopus* with 11 species-groups and *Isocladius* with 7 species-groups. Ten of the species we studied belong to the subgenus *Cricotopus*, only *C. sylvestris* belongs to the subgenus *Isocladius* in the *sylvestris*-group. The species are related to species groups as follows: *C. varipes*, *C. slossonae*, *C. annulator* and *C. infuscatus* in the *tremulus*-group; *C. festivellus* in the *festivellus*-group; *C. bicinctus* in the *bicinctus*-group, *C. trifascia* in the *trifascia*-group.

C. luciae and *C. politus* do not fit into any of Hirvenoja's species-groups. A revision of Nearctic *Cricotopus* would have to include two new species-groups for these and other species yet to be described completely or discovered.

All species listed here belong to the subgenus *Cricotopus* except for *C. sylvestris* which belongs to *Isocladius*.

KEYS TO *CRICOTOPUS* SPECIES FROM SALEM CREEK, SOUTHERN ONTARIO

Males

- 1—Basal lobe of the gonocoxite biramous, not directed backwards (Figs. 2, 5, 7, 8) 2
- Basal lobe of the gonocoxite uniramous, directed backwards (Figs. 10, 12, 14, 16, 18, 20), at most weakly notched (Fig. 15) 6
- 2—Tergites I-II white, the rest dark brown. Anal point usually present. Inner lobe of gonostyle not developed (Figs. 2, 4, 5) 3
- Coloration different. Anal point absent. Inner lobe of gonostyle well developed (Figs. 7, 8) 4
- 3—All fore tarsi dark brown (Fig. 2f).....*C. varipes* Coquillett
- Fore tarsus 1 and basal half of tarsus 2 light (Fig. 5f) *C. slossonae* Malloch

4—Tergites III-IV white at least on posterior half (Fig. 8i)
*C. triannulatus* (Macquart) 5
 —Tergites III-IV brown (Figs. 7, 10) 5

5—Small species, 2.6 (2.3-3.2) mm long. White ring on fore tibia. Tergal chaetotaxy reduced (Fig. 7a). Anterior lobule of basal lobe of gonocoxite much larger than posterior lobule (Fig. 7f).....*C. annulator* (Goetghebuer)
 —Medium sized species 3.1 (2.9-3.6) mm long. No white ring on fore tibia. Anterior lobule of basal lobe of gonocoxite about the same size or smaller than the posterior lobule (Fig. 10d,e).....*C. infuscatus* (Malloch)

6—Tergites brown, unicolored (Figs. 12, 14) 7
 —Tergites bicolored, either white or brown (Figs. 15, 16, 18, 20)..... 8

7—Abdomen shining green. Hypopygium as in figure 12g
*C. politus* (Coquillett)
 —Abdomen dark brown to black. Hypopygium as in figure 14i
*C. luciae* Lesage & Harrison

8—Basal lobe of gonocoxite absent (Fig. 18e).....*C. trifascia* Edwards
 —Basal lobe of gonocoxite well developed (Figs. 15, 16, 20)..... 9

9—Tergite VII completely or partly white (Fig. 20f). Median tergal setae much stronger than lateral setae (Fig. 20a) *C. sylvestris* (Fabricius)
 —Tergite VII brown. Median and lateral setae of equal size (Figs. 15a, 16a) 10

10—Tergite IV brown anteriorly (Fig. 15i). Median tergal setae uniserial (Fig. 15a). Basal lobe of gonocoxite weakly notched (Fig. 15e, d, h) not elongated *C. festivellus* (Kieffer)
 —Tergite IV completely white (Fig. 16h). Median tergal setae biserial (Fig. 16a). Basal lobe of gonocoxite elongated, not notched (Fig. 16e, g)
*C. bicinctus* (Meigen)

Females

1—Spermathecal ducts straight (Figs. 16, 18) 2
 —Spermathecal ducts looped or S-shaped (Figs. 2, 5, 7, 8, 10, 12, 15, 20) 3

2—Small species less than 3 mm long. Wing vein R₄₊₅ with less than 4 setae (Fig. 16c). Less than 10 sensilla chaetica on mid hind legs
*C. bicinctus* (Meigen)
 —Large species more than 3 mm long. Wing vein R₄₊₅ with more than 5 setae (Fig. 18a). More than 30 sensilla chaetica on mid and hind legs
*C. trifascia* Edwards

3—Abdominal tergites with uniform coloration, usually brown (Figs. 7, 10, 12, 14) 4
 —Abdominal tergites bicolored, either entirely or partly white or brown (Figs. 2, 7, 8, 15, 20) 7

4—Spermathecae pear-shaped (Fig. 12f). Two transverse rows of setae present on tergites (Figs. 12a) *C. politus* (Coquillett)
 —Spermathecae roundish. One transverse row of setae present on tergites (Figs. 7, 10, 14) 5

5—Wing, squama with more than 13 setae, vein R with more than 12 setae (Fig. 14c). Spermathecae less than 80 μm diameter (Fig. 14g)
*C. luciae* LeSage & Harrison
 —Wing, squama with less than 13 setae, vein R with less than 12 setae (Figs. 7c, 10c) spermathecae more than 80 μm diameter (Figs. 7g, 10g) 6

- 6—Small species usually less than 3 mm long. Thoracic mesonotal bands not contrasting on the dark brown ground color. Antennal preapical setae more than 210 μm . Wing vein R_1 without setae (Fig. 7c)
 -*C. annulator*, Goetghebuer (dark specimens)
- Medium sized species usually more than 3 mm long. Thoracic mesonotal bands sharply contrasting on the yellowish ground color. Antennal preapical setae less than 210 μm . Wing vein R_1 with 3-8 setae (Fig. 10c)
 -*C. infuscatus* (Malloch)
- 7—Tergites I-II white (Figs. 2, 5, 7) or paler than others (Fig. 7d)..... 8
- Coloration different 10
- 8—Tergites I-II faintly paler (Fig. 7d). Paratergal setae absent
 -*C. annulator* Goetghebuer (light color specimens)
- Tergites I-II white. Paratergal setae present (Figs. 2, 5)..... 9
- 9—Fore tarsi all dark brown *C. varipes* Coquillett
- Basal half of fore tarsus 1 light *C. n. sp. ?*
- Fore tarsus 1 and basal half of tarsus 2 light.....*C. slossonae* (Malloch)
- 10—Tergites I, IV-V white (Fig. 8i). Genitalia, figure 8g
 -*C. triannulatus* (Macquart)
- Tergites I, V-VI white (Fig. 15i). Genitalia, figure 15g
 -*C. festivellus* (Kieffer)
- Tergites I, IV-VII white (Fig. 20f). Genitalia, figure 20e
 -*C. sylvestris* (Fabricius)

Pupae

- 1—Pronotal horn cylindrical and bare; (Fig. 21c); Tergites II-IV wholly covered by spicules (Fig. 21a).....*C. sylvestris* (Fabricius)
- Pronotal horn acute (Figs. 3, 6, 9, 11, 13, 17, 19, and Hirvenoja 1973, Figs. 122, 137), usually covered with spicules apically, with spicules on tergites II-IV grouped in patches 2
- 2—Inner anal seta much smaller than outer anal seta (Fig. 19b)
 -*C. trifascia* Edwards
- Inner anal seta equal in size to other setae (Figs. 3, 6, 9, 11, 13, 17, and Hirvenoja 1973, Figs. 122, 137) 3
- 3—Frontal setae present 4
- Frontal setae absent..... 7
- 4—Anterior and mid patches of spines fused together on tergites III-VI (cf. Hirvenoja 1973, Fig. 137) *C. festivellus* (Kieffer)
- Anterior and mid patches of spines well separated on tergites III-VI (Figs. 3, 6, 9, 11, 13, 17) and Hirvenoja 1973, Fig. 122)..... 5
- 5—With rough granulation along the eclosion line (Fig. 17c)
 -*C. bicinctus* (Meigen)
- Almost smooth along the eclosion line 6
- 6—Smaller, 3.7 (2.5-4.2) mm long. Anterior patches of spines on tergites III-VI reniform, about twice as wide as long (Fig. 9a)
 -*C. triannulatus* (Macquart)
- Larger 4.7 (3.6-4.9) mm long. Anterior patches of spines on tergites III-VI transverse, about three times as wide as long (Fig. 11a)
 -*C. infuscatus* (Malloch)

- 7—With a patch of spines in front of rows of recurved spines on tergite II (Fig. 13a) *C. politus* (Coquillett)
 —Without a patch of spines in front of rows of recurved spines on tergite II (Figs. 3, 6 and in Hirvenoja 1973, Fig. 122) 8
- 8—Four lateral setae on tergites VIII (Fig. 6a) *C. slossonae* Malloch
 —Five lateral setae on tergite VIII (Fig. 3a) *C. varipes* Coquillett

Larvae

- 1—Premandible bidentate (Fig. 21f). Hair tufts on abdomen very long (Fig. 21g) more than 275 μm *C. sylvestris* (Fabricius)
 —Premandible simple (Figs. 3, 6, 9, 11, 17, 18). Hair tufts on abdomen shorter, less than 200 μm 2
- 2—Median tooth of hypostomium large about three times as broad as the first lateral tooth (Figs. 12c, 17d, 19f) 3
 —Median tooth of hypostomium moderately large usually less than 2.5 times as broad as the first lateral tooth (Figs. 3, 6, 9, 11) 5
- 3—Mandible serrate on the inner edge (Fig. 12f) *C. bicinctus* (Meigen)
 —Mandible smooth on the inner edge (Figs. 17, 19) 4
- 4—First and second lateral teeth of hypostomium very small and almost fused with median teeth (Figs. 19f)..... *C. trifascia* Edwards
 —First and second lateral teeth equal in size to other lateral teeth, not fused with median tooth (Figs. 12c) *C. politus* (Coquillett)
- 5—Outer edge of the mandible smooth (Figs. 3i, 6h)
 *C. varipes* Coquillett, *C. slossonae* Malloch
 —Outer edge of mandible crenulate (Figs. 9g, 11h) 6
- 6—Basal portion of mandible brownish. Hypostomial ratio usually smaller, 0.50-0.61 (Fig. 11h) *C. infuscatus* (Malloch)
 —Basal portion of mandible light. Hypostomial ratio usually larger, 0.52-0.65 (Fig. 9h) *C. triannulatus* (Macquart)

Cricotopus (Cricotopus) varipes Coquillett

Cricotopus varipes Coquillett, 1902:93 (original description, male).

Cricotopus varipes Coquillett Johannsen, 1905:256 (description of adults, immature stages); Johannsen in Johannsen & Townes, 1952:18 (in key, adults) Sublette, 1966b:591 (redescription of male); Sublette, 1967:560 (supplemental description of male).

MALE (Fig. 2).

Length. 3.1 (2.7-3.5) mm; thorax 0.9 (0.8-1.1) mm; abdomen 2.1 (1.9-2.4) mm.

Thorax. Mesonotal bands dark brown not contrasting with the dark-brown, ground colour of thorax. All thoracic sclerites dark brown.

Wings. With a brownish tint. Length 1873 (1515-2121) μm , width 572 (505-646) μm . Setae: first axillary sclerite with one seta; remigium 1.1 (1-2); squama 7.4 (5-10); vein R 6.4 (5-8), proximal; R_1 0; R_{4+5} 0. Anal lobe weakly produced.

Legs. Fore tibia with a white ring, basal dark brown portion about $\frac{1}{4}$ - $\frac{1}{3}$ the size of apical brown portion; mid and hind tibiae with a more or less distinct

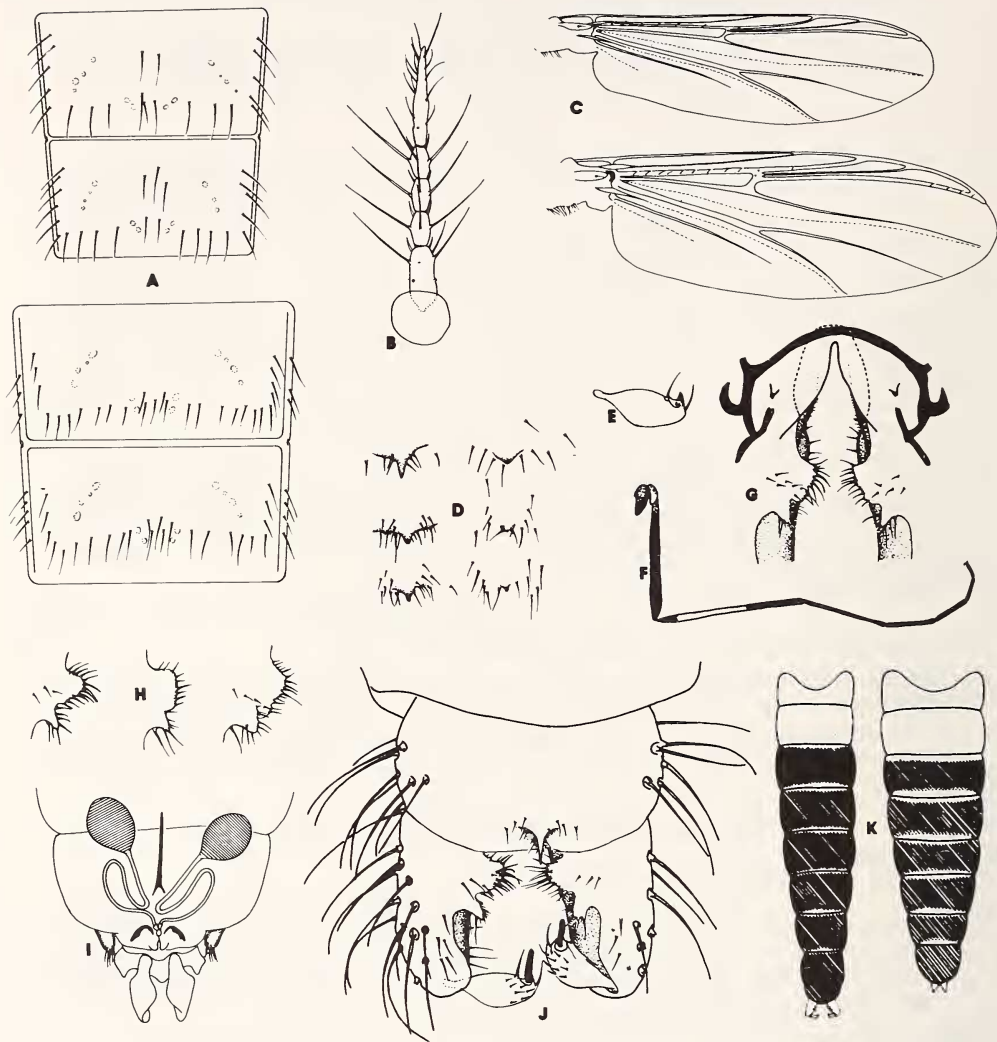


FIG. 2. *Cricotopus varipes* Coquillett, imagines. A, chaetotaxy on abdominal tergites III-IV of the male (upper), and the female (lower). B, antenna, female. C, wing, male (upper), female (lower). D, anal point, variation. E, male gonostylus, apical spine not shown. F, fore leg, coloration. G, male hypopygium, ventral view. H, basal lobe of gonocoxite, variation. I, female genitalia, ventral view (ventral lobe of gonapophysis IX not shown here and in the next figures). J, male hypopygium, dorsal view. K, abdominal coloration male (left), female (right).

yellowish ring. Fore tarsi all dark brown, mid and hind tarsi brownish to brown. Sensilla chaetica 13.0 (11-15), present only on 1/5-2/5 of hind legs.

Abdomen. Abdominal tergites I-II white; III-VII dark brown with narrow light band on anterior and posterior margins, VIII dark brown. Chaetotaxy reduced on tergites III-IV; median setae biserial; lateral setae uniserial on each side of tergites and also forming a transverse row of setae on posterior portion of tergites. Tergal chaetotaxy:

	median setae	lateral setae
Tergite III	5.4 (4-7)	9.8 (8-13)
Tergite IV	6.2 (4-8)	10.2 (8-13)

Hypopygium. White. Length of gonocoxite 196 (174-217) μm , length of gonostylus 64 (52-75) μm . Anal point triangular, long, sharp 13.3 (9-20) μm and bearing 1-3 setae on each side. Basal lobe biramous, anterior lobe larger, directed mediad or weakly cephalad, more or less apically rounded, covered by robust setae, posterior lobe triangular, smaller directed caudad and bearing rather robust macrotrichia. Gonostylus with a weakly developed inner edge but dark brown and pointed apically, and bearing a long, apical spine (14-20) μm .

FEMALE (Fig. 2)

Length 3.0 (2.7-3.5) mm; thorax 1.0 (0.9-1.2) mm; abdomen 2.0 (1.7-2.3) mm.

Antenna. Preapical seta present 67 (61-75) μm .

Thorax. Coloration as in the male.

Wings. With a brownish tint. Length 2141 (1899-2404) μm ; width 769 (707-848) μm . Setae: first axillary sclerite with one seta; remigium 1.1 (1-2); squama 10.2 (7-16); vein R 11.2 (8-14) all along; R_1 1.0 (0-2) proximal; R_{4+5} 4.1 (2-5) distal. Anal lobe obtuse.

Legs. Coloration as in the male. On basal 1/3-3/5 of mid leg, 26.6 (22-31) sensilla chaetica and 24.1 (21-26) on basal 5/12 of hind leg.

Abdomen. Coloration as in the male. In dark specimens, sternites III-VII with a grey-blue tint and brown infuscation. Chaetotaxy reduced on abdominal segments III and IV; median setae generally concentrated in group between posterior muscle marks; lateral setae uniserial on each side of tergites and forming a transverse row of setae on posterior 1/3; paratergal setae present. Tergal chaetotaxy:

	median setae	lateral setae	paratergal setae
Tergite III	4.6 (2-7)	8.8 (6-11)	2.6 (1-5)
Tergite IV	4.9 (2-7)	8.1 (6-12)	3.7 (2-7)

Genitalia. Cerci white. Spermathecae dark brown, roundish 92 (78-113) μm long, 73 (61-78) μm wide. Spermathecal ducts S-shaped. Lateral sternites of abdominal segment IX moderately developed.

PUPA (Fig. 3)

Colour: exuvia brown, somewhat paler on tergites I, VII and VIII. Length of exuvia 4.1 (4.1-4.3) mm, cephalothorax 2.9 (2.8-2.9), abdomen 1.3 (1.2-1.4).

Cephalothorax. Anterior part of notum granular in a very narrow band along the eclosion line. Pronotal horn, pointed, translucent, covered by spinules on apical

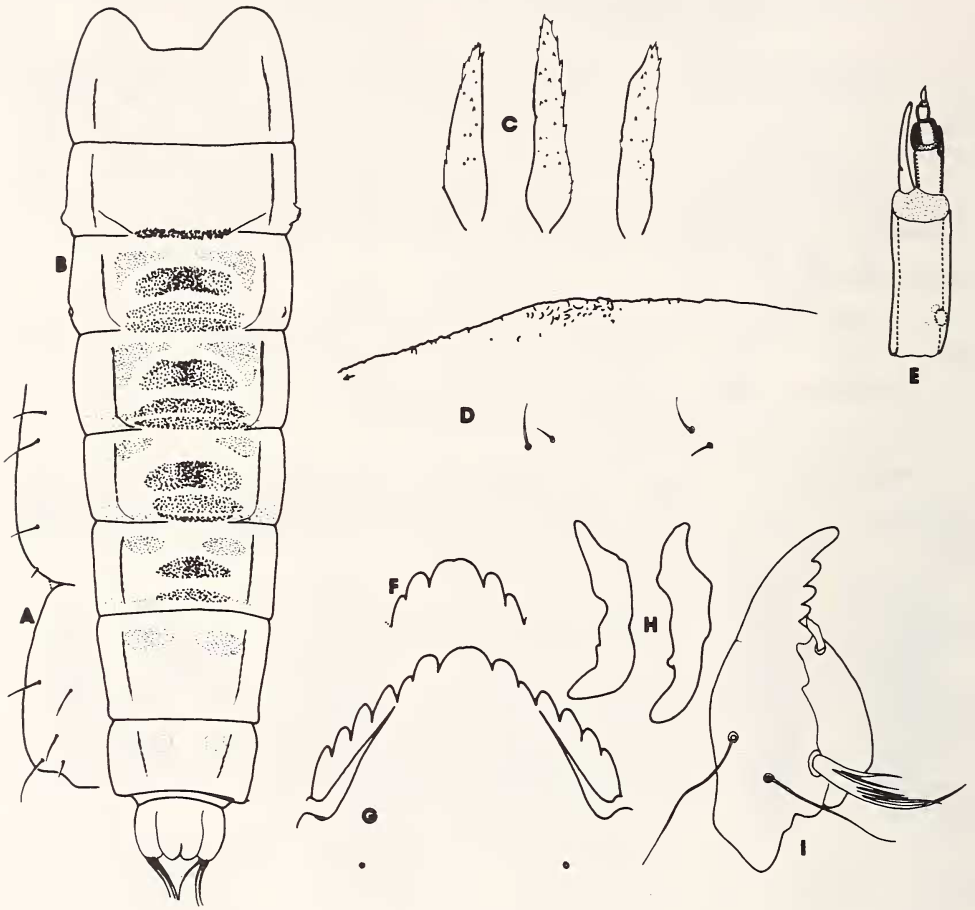


FIG. 3. *Cricotopus varipes* Coquillett, pupa A-D, larva E-I. A, lateral setae on abdominal segment IV. B, ornamentation of pupal exuvia, dorsal view. C, prothoracic horn, variation. D, ornamentation along eclosion line and dorsocentral setae. E, antenna. F, mid and first two, lateral teeth of hypostomium, variation. G, hypostomium, ventral view. H, premandible, variation. I, mandible.

$\frac{2}{3}$, 103 (73-116) μm long, 18 (16-20) μm wide. Prothoracic horn ratio 5.56 (4.57-6.80). Frontal tubercle and frontal setae absent.

Abdomen. Length of longest anal seta 168 (148-174) μm . Pedes spurii B large on abdominal segment II, small on segment III. Setae present on abdominal segments I-VIII:

	I	II	III	IV	V	VI	VII	VIII
dorsals	4	4-5	4-5	5	5	5	4-5	1
laterals	1	2	3	3	5	5	5	5
ventrals	0	3-4	3-4	4	4	4	4	1

Tergites: I bare; II sometimes with a very small median spine patch in front of the transverse patch of 85 (76-103) recurved spines, biserial; III-V with three patches of spines, one anterior, reniform patch widely separate from the median patch which is elongated, transverse and narrowly separated from the posterior, transverse, spine patch, and with a small, shagreen patch anteriorly on each side; VI with two, distinctly divided in three parts, one small patch of shagreen on each side anteriorly; VII-VIII with 2 patches of shagreen on basal third.

LARVA (Fig. 3)

Fourth-instar larva (exuvia) 4.8 (4.0-5.3) mm long. Head capsule brownish somewhat darker posteriorly and laterally.

Antenna 69 (63-73) μm long, 0.49 (0.47-0.53) as long as mandible, 5.61 (5.27-5.83) times as long as wide. Lauterborn's organs large, antennal blade extending to or sometimes beyond the apex of antennomere 4, accessory seta extending to the basal third of antennomere 3 and sensory seta to apex of antennomere 3 or base of 4. Antennal ratio 0.56 (0.52-0.62). Labral setae SI bifurcated. Epipharynx with four chaetulae laterales and two chaetulae basales; pecten with three slender setae.

Premandible simple. Distal part of mandible dark brown to black with smooth inner margin and outer edge or sometimes with very weak indistinct crenulations on outer edge.

Hypostomium 125 (109-134) μm wide, 75 (66-80) μm long. Hypostomial ratio 0.60 (0.58-0.61). Median tooth and the first two lateral teeth more or less distinctly paler than other lateral teeth. Median tooth convex, first two lateral teeth partly fused together, the second about half the size of the first. Lateral teeth 3-6 slightly and regularly decreasing in size.

Anal gills sausage-shaped tapering towards apex. Claws on anterior prolegs brown, small and very numerous, somewhat darker than the large posterior claws on posterior pseudopods. Lateral hair tufts on abdominal segments I-VII well developed, 114 (68-136) μm long.

Remarks. The abdominal tergites I-II white and the fore tarsi all dark, readily distinguish the adults of *Cricotopus varipes* from others. The male characters vary considerably in this species; the anal point was either absent in two specimens, weakly developed in a few, but usually quite robust; the basal lobe of the gonocoxite has usually the anterior portion wider than long and angular but it varied also from a lobe resembling that illustrated for *C. tristis* (Hirvenoja 1973) to that of the holotype male (Sublette 1966b). The presence of paratergal setae on the abdomen of females is an additional character shared only by females of *C.*

slossonae having, however, light fore tarsi. Superficially, *C. varipes* resembles the European *C. tristis* but the male and female genitalia are different.

The general ornamentation and the absence of frontal setae distinguished the pupa from others. On specimens examined, the presence of five lateral setae on the abdominal segment VIII was the only reliable character found for the separation of *C. varipes* from *C. slossonae* which bears four setae on this segment.

The shape of the hypostomium and the smooth, outer edge of the mandible separate the larva of *C. varipes* from all others except *C. slossonae*. No features could be found to separate these two species. However, several important characters found on other parts of the body were not visible on specimens examined (four exuvia).

C. varipes is closely related to *C. slossonae*. The two species are similar in the colour of tarsi in the adults and by the presence or absence of one tiny seta in the pupae. Nevertheless, the colour of the tarsi in the adults revealed a third "form" which has only the fore tarsus 2 light (Fig. 4). This colour pattern is intermediate between the completely dark fore tarsus in *C. varipes* and the light fore tarsus 2 and partly light fore tarsus 3 of *C. slossonae*. An ecological study of these three "forms" (LeSage & Harrison 1980, n.sp?) suggests that they might be three different species. The ovipositing females could be readily separated into three groups according to the leg coloration. Only pure swarms of *C. varipes* males having distinct dark tarsi were collected. Finally, in the spring, there was succession in the emergence of these forms, *C. varipes* emerging first, followed by the possible new species and later by *C. slossonae*. This succession occurred in reverse in the fall. However, it seems appropriate for the moment to preserve the name of *C. varipes* and *C. slossonae* as valid species but not to create a new name for the intermediate form since the ecological evidence is only partial and the immature stages of this third form are still unknown.



FIG. 4. *Cricetopus* n.sp.?. Fore leg, coloration.

Distribution. Reported from FLORIDA (Beck & Beck 1959, Sublette & Sublette, 1965) to NORTHWEST TERRITORIES (Rosenberg & Wiens 1976).

Material examined. Holotype male, Great Falls, Maryland, June 5, H. S. Barber. In the U.S. National Museum, Washington, type No. 6175. On slide: ONTARIO, Elmira, Salem Creek, 7 ♂♂ 21-31.V.76, 19 ♂♂ 1.V.77-4.XI.77, 2 ♂♂ 18-25.V.78, 14 ♀♀ 21-31.V.76, 17 ♀♀ 15.V.77-19.X.77. Associated larva-pupa-adult: Elmira, Salem Creek, 1.V.1978 (1 ♂), 11.V.78 (1 ♂), 29.V.78 (1 ♀),

31.V.78 (2 ♀ ♀), 2.VI.78 (1 intersex). In alcohol: Elmira, Salem Creek, 550 ♂ ♂, 675 ♀ ♀ from May, 1976 to November, 1978.

Cricotopus (Cricotopus) slossonae Malloch

Cricotopus slossonae Malloch, 1915:506 (original description, female).

Cricotopus slossonae Malloch, Walley, 1928 (key, adults): Johannsen in Johannsen & Townes, 1952:18 (key, adults): Roback, 1957a: 71 (description, key, larva, pupa): Sublette, 1970:60 (redescription, female).

C. (C.) slossonae Malloch, Saether, 1977:116 (illustration, female genitalia).

Orthocladius sp. D. Malloch, 1915:531, *fide* Roback, 1957a: 71 (description, pupa).

MALE (Fig. 5)

Length 3.1 (2.4-3.8) mm; thorax 0.9 (0.7-1.1) mm; abdomen 2.1 (1.7-2.7) mm.

Thorax. Mesonotal bands dark brown not contrasting with the dark brown ground colour of thorax. All thoracic sclerites dark brown.

Wings. With a brownish tint. Length 1802 (1414-2121) μm , width 519 (424-626) μm . Setae: first axillary sclerite with one seta; remigium 1.1 (1-2); squama 7.2 (4-11); vein R 5.2 (3-8) proximal; R_1 0; R_{4+5} 0. Anal lobe obtuse.

Legs. White ring on fore tibia, apical dark portion about 5 times longer than basal dark portion, mid and hind tibiae with more or less distinct large yellowish ring. Fore tarsi 1, 4-5 dark brown; fore tarsi 2 and basal $\frac{2}{3}$ of fore tarsi 3 whitish. Mid and hind tarsi yellowish or pale brown. 11.0 (8-14) sensilla chaetica only on basal $\frac{1}{4}$ of hind legs.

Abdomen. Tergites I-II white, III-VII dark brown and generally with distinct pale narrow band along anterior and posterior margins, VIII dark brown. In dark specimens sternites III-VII with a grey-blue tint and brown infuscation. Chaetotaxy reduced on tergites III-IV; median setae generally biserial; lateral setae uniserial on each side of the abdomen and also forming a transverse row of setae on the posterior portion of tergites. Tergal chaetotaxy:

	median setae	lateral setae
Tergite III	5.3 (3-7)	10.6 (7-18)
Tergite IV	6.4 (4-8)	10.1 (6-15)

Hypopygium. White. Length of gonocoxite 189 (165-217) μm , gonostylus length 61 (52-78) μm . Anal point small to robust, transparent with setae at its base. Basal lobe biramous: anterior lobe apically roundish to angular, directed medially and bearing robust setae, posterior lobe triangular, directed caudally and bearing weaker setae. However shape very variable. Dististyle dark brown apically and pointed with apical spine 20 μm long and inner edge weakly developed.

FEMALE (Fig. 5)

Length 3.0 (2.6-3.7) μm ; thorax 1.0 (0.9-1.3) mm; abdomen 2.0 (1.7-2.4) mm.

Antenna. Preapical seta present 67 (59-70) μm .

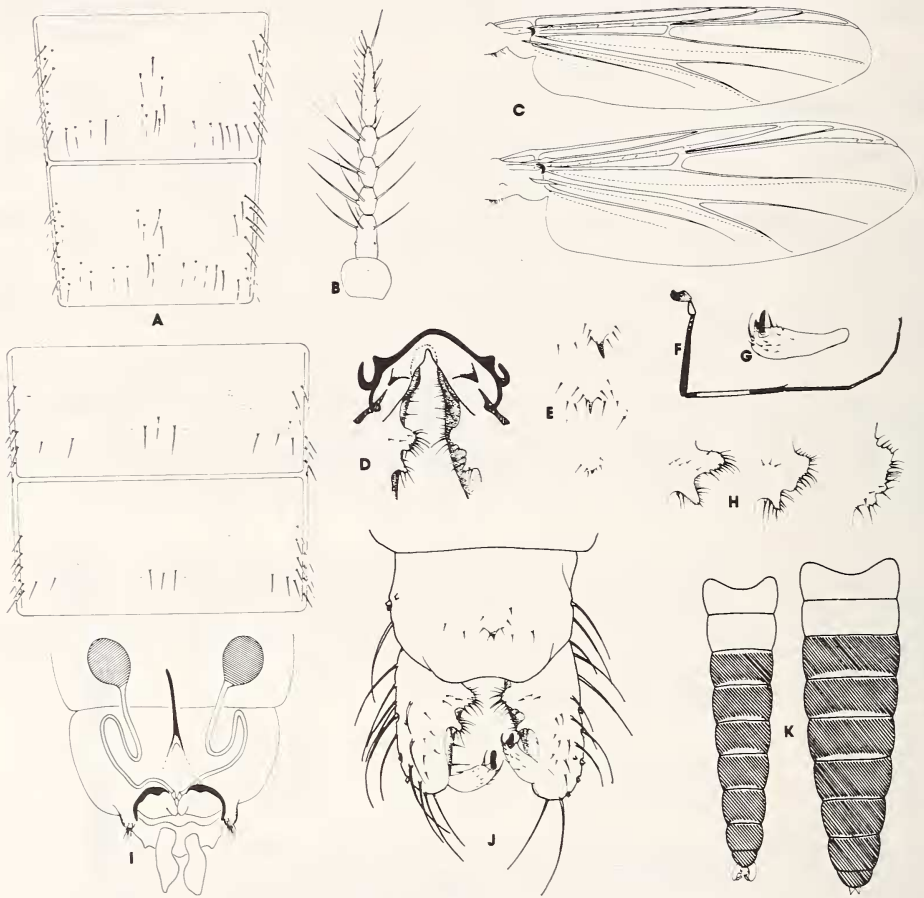


FIG. 5. *Cricotopus slossonae* Malloch, imagines. A, chaetotaxy on abdominal tergites III-IV of the male (upper), and the female (lower). B, antenna, female. C, wing, male (upper), female (lower). D, male hypopygium, ventral view. E, anal point, variation. F, fore leg, coloration. G, male gonostylus, variation. H, basal lobe of gonocoxite, variation. I, female genitalia, ventral view. J, male hypopygium, dorsal view. K, abdominal coloration, male (left), female (right).

Thorax. Coloration as in the male.

Wings. With a brownish tint. Length 1925 (1697-2101) μm , width 721 (626-848) μm . Setae: first axillary sclerite with one seta, remigium 0.1 (1-2); squama 11.0 (8-15); vein R 11.6 (9-18); R_1 0.9 (0-3); R_{4+5} 2.0 (1-5). Anal lobe obtuse, not produced.

Legs. Coloration as in the male. 33.8 (29-40) sensilla chaetica on basal $\frac{5}{8}$ - $\frac{2}{3}$ mid tarsi 1 and 23.2 (18-27) on basal $\frac{1}{3}$ hind tarsi 1.

Abdomen. Coloration as in the male. In dark specimens, sternites III-VII with a grey-blue tint and brown infuscation. Chaetotaxy reduced on tergites III-IV; median setae generally grouped between posterior muscle marks; lateral setae generally uniserial on each side of tergites and also forming a transverse row of setae on posterior portion of tergites. Tergal chaetotaxy:

	median setae	lateral setae	paratergal setae
Tergite III	3.8 (2-6)	9.4 (8-14)	2.4 (1-5)
Tergite IV	4.4 (2-6)	8.5 (6-10)	4.3 (2-8)

Genitalia. Cerci white. Spermathecae dark brown, roundish, 93 (78-102) μm long, 76 (64-80) μm wide. Spermathecal ducts S-shaped. Lateral sternites of abdominal segment IX moderately developed.

PUPA (Fig. 6)

Colour: exuvia brown, somewhat paler on I, VII and VIII. Length of the exuvia (mm) 3.8 (3.1-4.2); cephalothorax 2.6 (2.1-2.9); abdomen 1.1 (1.0-1.2).

Cephalothorax. Anterior part of notum granular in a very narrow band along the eclosion line. Pronotal horn, pointed, translucent, covered by spinules on apical $\frac{2}{3}$, 106 (91-127) μm long, 20 (18-23) μm wide. Prothoracic horn ratio 5.35 (4.30-6.22). Frontal tubercule and frontal setae absent.

Abdomen. Anal lobe length 250 (243-261) μm longest anal setae length 165 (157-174) μm . Pedes spurii B large on abdominal segment II, small on segment III. Setae present on abdominal segments I-VIII:

	I	II	III	IV	V	VI	VII	VIII
dorsals	4	4-5	4-5	5	5	5	4-5	1
laterals	1	2	3	3	5	5	5	4
ventrals	0	3-4	3-4	4	4	4	4	1

Tergites: I bare; I with sometimes very small median spine patch in front of the transverse patch of 78 (68-92) μm recurved spines, biserial; III-V with three spine patches, one anterior reniform widely separated from the median patch which is elongated and transverse and close to the posterior transverse spine patch, and with small shagreen patches anteriorly on each side; VI with two median spine patches; posterior patch transverse more or less distinctly divided in three parts; one small patch of shagreen on each side anteriorly; VII-VIII with 2 patches of shagreen on basal third.

LARVA (Fig. 6)

Fourth instar larvae 4.4 (3.5-5.1) mm long (exuvia). Head capsule brownish somewhat darker posteriorly and laterally.

Antenna 72 (62-79) μm long, 0.49 (0.44-0.56) as long as mandible, 5.24

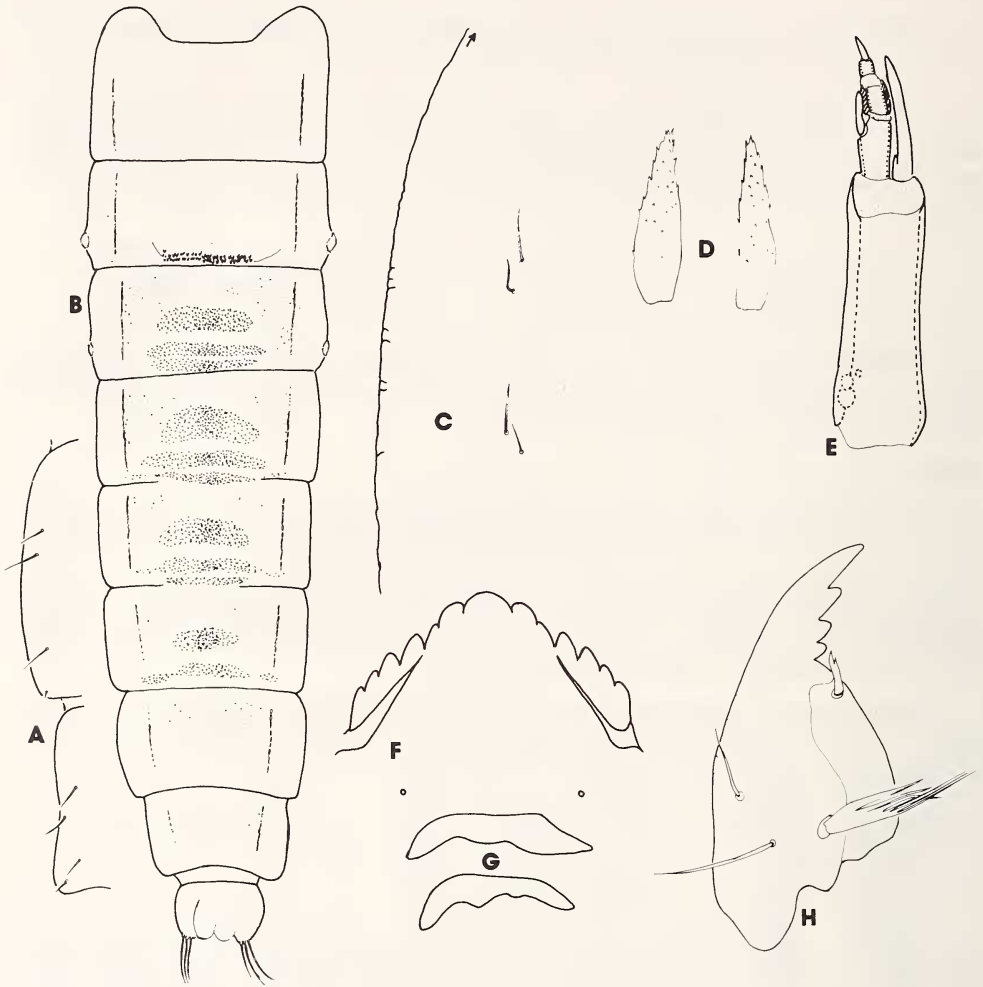


FIG. 6. *Cricotopus slossonae* Malloch, pupa A-D, larva E-H. A, lateral setae on abdominal segment IV. B, ornamentation of pupal exuvia, dorsal view. C, ornamentation along eclosion line and dorsocentral setae. D, prothoracic horn, variation. E, antenna. F, hypostomium, ventral view. G, premandible, variation. H, mandible.

(4.29-6.00) times as long as wide. Lauterborn's organs large, antennal blade extending to or sometimes beyond the apex of antennomere 4, accessory seta to the basal $\frac{1}{3}$ of antennomere 3, and sensory seta to apex of antennomere 3, or base of 4. Antennal ratio 0.50 (0.38-0.58). Labral setae SI bifurcated. Epipharynx with four chaetulae laterales and two chaetulae basales; pecten with three slender setae.

Premandible simple. Distal part of the mandible dark brown to black with smooth inner margin and outer edge, or sometimes with very weak indistinct crenulations on outer edge.

Hypostomium 126 (118-136) μm wide, 75 (68-82) μm long. Hypostomial ratio 0.60 (0.58-0.61). Median tooth and the first two, lateral teeth more or less distinctly paler than other lateral teeth. Median tooth convex, first two, lateral teeth partly fused together, the second about half the size of the first; lateral teeth 3-6 slightly and regularly decreasing in size.

Anal gills, sausage-shaped tapering towards apex. Claws on anterior prolegs brown, small and very numerous, somewhat darker than the large posterior claws on posterior pseudopods. Lateral hair tufts on abdominal segments I-VI well developed 128 (102-148) μm .

Remarks: Adults of *Cricotopus slossonae* are readily recognizable by their light abdominal tergites I-II and their light fore tarsi 2 and partly light fore tarsi 3. The type specimen of this species, a female, has these typical characters as originally described. Reared males and females bearing this colour pattern were placed in the same species and this association was furthermore corroborated by the similar immatures of both sexes. The pupa differs from others by its ornamentation and the absence of frontal setae, but could be separated from *C. varipes* only on the basis of four setae present on abdominal segment VIII whereas there were five in *C. varipes*. As mentioned above, larvae of these two species were found similar on specimens examined but they are distinct from other species by the shape of the hypostomium and the features of the mandible.

See remarks under *C. varipes* for additional comments.

Distribution. Reported from GEORGIA (Patrick *et al.* 1967), to the NORTH-WEST TERRITORIES (Rosenberg & Wiens 1976).

Material examined. Holotype female. Algonquin, Illinois, 6-4-94-55 (W. A. Nason); in the Illinois Natural History Survey Collection, Urbana. On slide: ONTARIO Elmira, Salem Creek, 14 ♂♂ 19.V.6.VIII.77, 3 ♂♂ 25.V-1.VI.78, 13 ♀♀ 20.V-2.VI.77, 1 intersex 18.V.77. Associated larva-pupa-adult: Conestogo, Conestogo River, 29.V.78 (1 ♂♀, 2 ♀♀), 31.V.78 (1 ♂). In alcohol: Elmira, Salem Creek, 240 ♂♂, 270 ♀♀ from May 1976 to September 1978.

***Cricotopus (Cricotopus) annulator* Goetghebuer**

Cricotopus annulator Goetghebuer, 1927:52 (original description, male).

Cricotopus irwini, Sublette & Sublette, 1971:97 (original description, male), NEW SYNONYM.

Cricotopus (Cricotopus) annulator Goetgh. Hirvenoja, 1973:202 (redescription, keys, adults, pupa, larva).

MALE (Fig. 7)

Length. 2.6 (2.3-3.2) mm; thorax 0.8 (0.7-1.0) mm; abdomen 1.7 (1.6-2.2) mm.

Thorax. Shining. Mesonotal bands not contrasting with the dark brown ground colour.

Wing. Transparent, with a pale brownish tint. Length 1551 (1313-1980) μm , width 491 (404-606) μm . Setae: first axillary sclerite with one seta; remigium 1; squama 6.1 (4-7); vein R 3.7 (3-5) proximal; R_1 0; R_{4+5} 0. Anal lobe obtuse, not produced.

Legs. Fore tibia with white ring, distal dark brown band about 4-5 times larger than basal dark band; longer, more or less distinct, pale brown or yellowish ring on mid and hind tibiae. Fore tarsi brown, mid and hind tarsi paler. Sensilla chaetica 2.1 (0-6), sometimes present on basal 1/5 of mid tarsi 1, always present, 5.6 (5-7), on basal 1/5-1/6 of hind tarsi 1.

Abdomen. Greyish brown in general. Tergites I-II somewhat lighter, sometimes whitish in paler specimens, III with narrow more or less distinct anterior and posterior pale margins, IV-V paler on the first 1/3 and posterior 1/6, VI-VII with paler coloration on posterior 1/5, VIII dark brown. On tergites III-IV median setae in double row at least between posterior muscle marks; lateral setae uniserial with often a beginning of double row; transverse uniserial row of setae present posteriorly. Tergal chaetotaxy:

	median setae	lateral setae
Tergite III	3.8 (2-5)	10.3 (6-14)
Tergite IV	4.3 (3-6)	8.8 (7-16)

Hypopygium. White. Gonocoxite length 182 (148-200) μm , gonostylus length 33 (43-70) μm . Anal point absent. Basal lobe biramous, well developed; anterior part round, densely strongly setose, larger than posterior part, directed inwards, posterior part small, narrowly triangular, obliquely directed backwards. Inner edge of gonostylus large, well developed, with a small apical spine.

FEMALE (Fig. 7)

Length. 2.5 (2.0-3.0) mm; thorax 0.8 (0.7-1.0) mm; abdomen 1.6 (1.2-2.1) mm.

Antenna. Preapical seta present 232 (209-278) μm .

Thorax. Shining. Coloration as in the male.

Wing. Transparent, with a pale brownish tint. Length 1776 (1636-2000) μm , width 663 (606-747) μm . Setae: first axillary sclerite with one seta; remigium 1.1 (1-2); squama 7.4 (6-10); vein R 6.7 (4-9); R_1 0; R_{4+5} 3.8 (3-5) distal. Anal lobe obtuse.

Legs. Coloration as in the male. There were 7.8 (5-9) sensilla chaetica on basal 1/4-1/7 of mid tarsi 1, and 8.2 (6-10) on basal 1/5 (1/4-1/6) of hind tarsi 1.

Abdomen. Coloration similar to that of male, greyish brown. Tergites I-II generally paler than others sometime whitish, III-VII with distinct pale band on anterior 1/5 and a more or less distinct pale posterior margin in some specimens, VIII brown. On tergites III-IV median setae in double row at least posteriorly; lateral setae uniserial, more numerous caudad; transverse posterior row of setae present, uniserial. Tergal chaetotaxy:

	median setae	lateral setae
Tergite III	2.8 (2-3)	6.8 (5-10)
Tergite IV	2.9 (2-3)	7.5 (5-10)

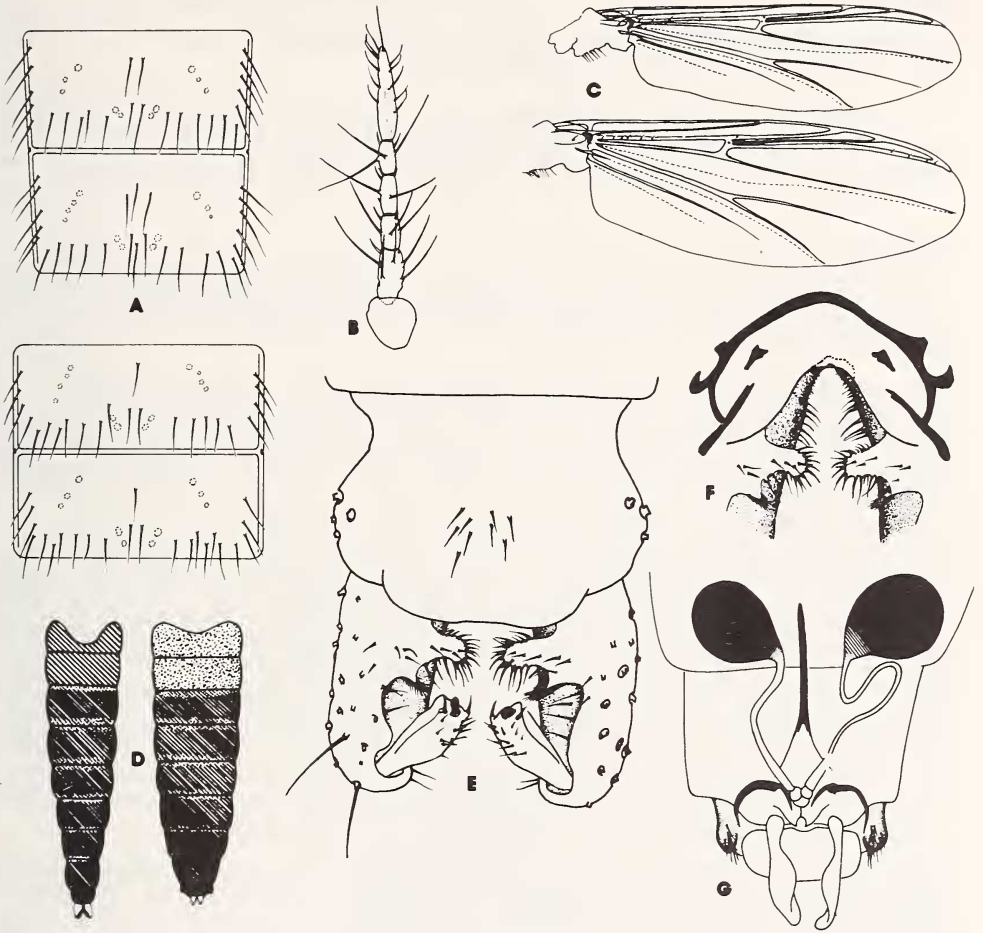


FIG. 7. *Cricotopus annulator* Goetghebuer, imagines. A, chaetotaxy on abdominal tergites III-IV of the male (upper), and the female (lower). B, antenna, female. C, wing, male (upper), female (lower). D, abdominal coloration, male (left), female (right). E, male hypopygium, dorsal view. F, male hypopygium, ventral view. G, female genitalia, ventral view.

Genitalia. Cerci white. Spermathecae brown, roundish or ovoid, 97 (78-122) μm long with a gradually narrowed seminal capsule. Spermathecal ducts strongly S-shaped, sometimes weakly curved (variability probably an artifact due to the process of mounting in Canada balsam). Lateral sternites of abdominal segment IX moderately developed.

PUPA

None found. The following characters described by Hirvenoja (1973) might help in the recognition of the pupa of this species.

Length about 3.5 mm. Prothoracic horn 15 (11-24) μm wide, 140 (113-184) μm long, acuminate and covered by spinules apically. Frontal tubercle and frontal setae absent. Pedes spurii B on segment II moderately developed, absent on segment III.

LARVA

None found. The following distinctive features are taken from Hirvenoja (1973), who bases his description on material of *C. bituberculatus* Goet. which he places in synonymy with *C. annulator*.

Length about 6 mm. Premandibular brush not visible. Antennal ratio 0.65-0.74. Lateral hair tufts (1+) of the abdominal segment I-VI small, at most the length of the segment, with more than 10 setae. Mandible dark, distally wholly black; outer edge almost smooth but with at least a notch. Hypostomium dark with median tooth about 2 times as wide as the first lateral tooth; the second lateral tooth small, the remaining teeth increasing somewhat in size.

Remarks. Small, unicoloured, dark-brown species which shows a distinctive, basal lobe in the male hypopygium, and the female having a few serial, abdominal setae, large spermathecae and curved spermathecal ducts. The types of *C. irwini* Sublette & Sublette and the material from Salem Creek correspond fairly well to the redescription of *C. annulator* by Hirvenoja (1973). Only minor differences from the European species were noted, among others: smaller wing size, slightly lower male antennal ratio and slightly fewer sensillae chaeticae on female legs. Our figures are averages and several specimens fall in the range of variations observed for *C. annulator*. Otherwise, both the type of *C. irwini* and the specimens from Salem Creek key out readily to *C. annulator* and *C. irwini* is considered here to be a synonym. The species is reported for the first time in Ontario.

Distribution. Reported from EUROPE, CANADA, LABRADOR (Hirvenoja 1973); sub *Cricotopus irwini* Sublette & Sublette: CALIFORNIA (Sublette & Sublette 1971).

Material examined. On slide: ONTARIO Elmira, Salem Creek, 4 δ δ , 1 φ , 6.V-24.V.1976; 18 δ δ , 10 φ φ , 11.V-15.X.1977; 6 δ δ , 1 φ , 18.V-1.VI.1978. In alcohol: Elmira, Salem Creek, about 465 δ δ , 435 φ φ from May 1976 to October 1978. Originally described as *Cricotopus irwini* Sublette & Sublette, holotype male, type No. 71262, USNM, (UCR. Ent. Mus. Specimen No. 22067). Deep Canyon, Riverside County, California, 18 May 1964, at light, M. E. Irwin. In the U.S. National Museum Collection, Washington.

Cricotopus (Cricotopus) triannulatus (Macquart)

Chironomus triannulatus Macquart, 1826-202 (original description, adult).

Cricotopus exilis Johannsen, 1905:255 (original description, male, pupa, larva)

NEW SYNONYM

Cricotopus exilis Johannsen, Malloch, 1915:444 (key, larva); Johannsen, 1937: 52 (description, key, pupa, larva); Johannsen in Johannsen & Townes, 1952: 17 (key, adults); Roback, 1957:69 (key, pupa, larva); Sublette, 1967b:517 (redescription, male).

Cricotopus (Cricotopus) triannulatus (Macq.), Hirvenoja, 1973:208 (redescription, key, adults, pupa, larva).

C. (C.) triannulatus (Macq.), Saether, 1977:117 (illustration, female genitalia).

MALE (Fig. 8)

Length. 2.9 (2.4-3.3) mm; thorax 0.9 (0.7-1.0) mm; abdomen 2.2 (1.6-2.3).

Thorax. Shining. Coloration variable with mesonotal bands more or less contrasting with the variable ground colour.

Wings. Transparent. Length 1770 (1454-1879) μm , width 570 (444-667) μm . Setae: first axillary sclerite with 1.4 (1-3) setae; remigium 1.2 (1-2); squama 6.3 (5-8); vein R 5.1 (3-8); R_1 0; R_{4+5} 0; Costa slightly extended beyond R_{4+5} , about $\frac{1}{2}$ length of r-m. Anal lobe variable moderately projected to roundly rectangular or obtuse.

Legs. Fore tibiae with white ring, distal brown band wider; white ring on mid and hind tibiae sometimes more or less obscured. Fore tarsi dark brown; mid and hind tarsi paler, pale brown or yellowish, with tarsi 4 and 5 somewhat darker. Sensilla chaetica, 7.9 (6-12) only on basal $\frac{1}{4}$ - $\frac{1}{5}$ of hind tarsi 1.

Abdomen. Coloration variable. Mature, dark specimens as follows: tergite I pale brown, II brown with narrow, anterior, yellow band, III wholly brown, IV-V brown with anterior $\frac{1}{3}$ - $\frac{2}{3}$ yellow more or less infuscated with brown, VI-VIII dark brown with a pale, narrow band on the posterior $\frac{1}{5}$. In light specimens, tergite I yellow, II and III with a yellow, anterior band and narrow posterior band, IV-V sometimes nearly completely yellow except for a very narrow, brown, posterior band, and VI-VIII also with a narrow, yellowish, anterior band. On tergites III-IV median setae in double row, not numerous; lateral setae uni- to biserial; transverse, uniserial row of setae present posteriorly. Tergal chaetotaxy:

	median setae	lateral setae
Tergite III	4 (3-5)	9.7 (8-14)
Tergite IV	4.7 (4-6)	10.7 (8-18)

Hypopygium. White. Gonocoxite length 183 (165-200) μm , gonostylus length 63 (48-70) μm . Anal point absent. Basal lobe biramous; anterior part larger, round with rather strong marginal setae, posterior part triangular, smaller, less setose. Inner edge of gonostylus weakly developed.

FEMALE (Fig. 8)

Length. 2.6 (2.2-2.9) mm; thorax 0.9 (0.8-1.1) mm; abdomen 1.7 (1.4-1.9) mm.

Antenna. Preapical setae present 172 (148-217) μm .

Thorax. Shining. Coloration much lighter than in the male. Mesonotal bands sharply contrasting on yellow ground colour, sometimes infuscated with brown.

Wings. Transparent. Length 1828 (1495-2020) μm , width 683 (606-747) μm . Setae: first axillary sclerite with one seta; remigium 1; squama 7.7 (6-10); vein R 9.1 (8-11); R_1 0.3 (0-1); R_{4+5} . Anal lobe, not produced, obtuse.

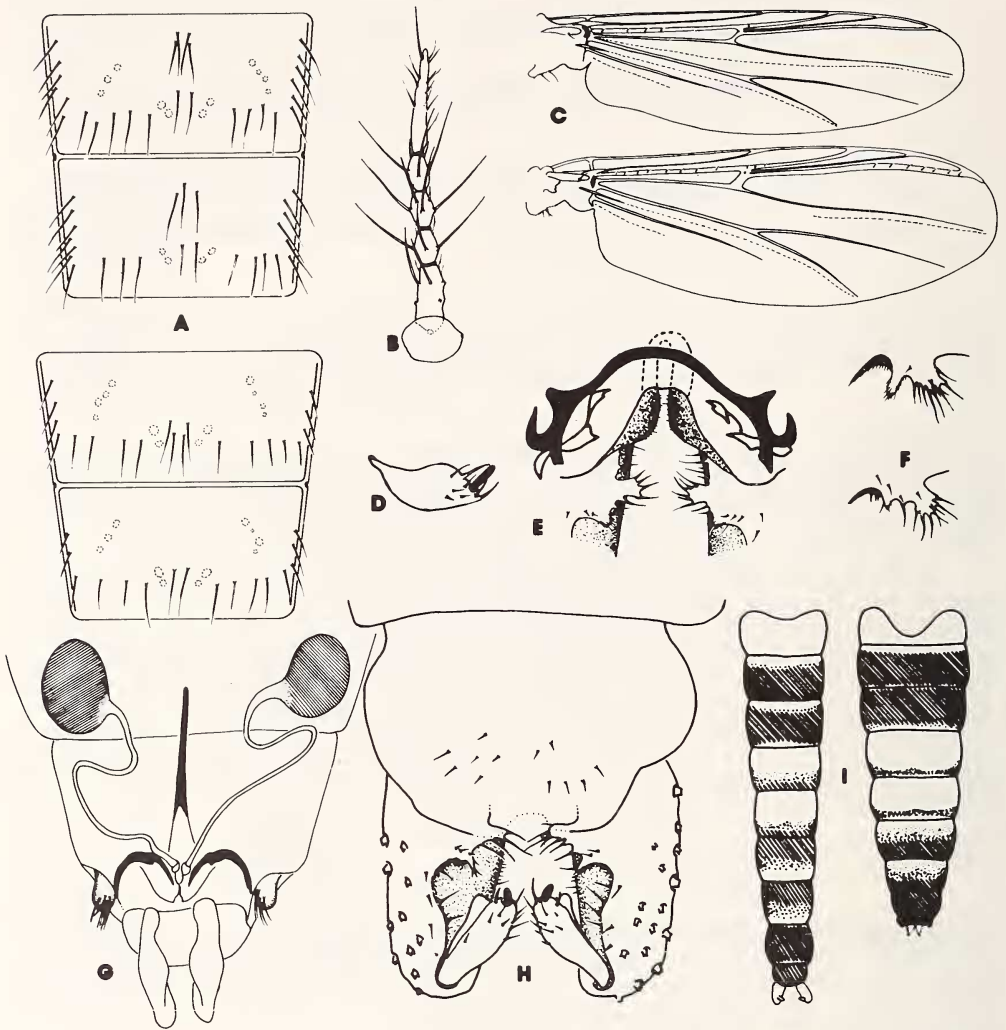


FIG. 8. *Cricotopus triannulatus* (Macquart), imagines. A, chaetotaxy on abdominal tergites III-IV of the male (upper), and the female (lower). B, antenna, female. C, wing, male (upper), female (lower). D, male gonostylus, variation. E, male hypopygium, ventral view. F, basal lobe of gonocoxite, variation. G, female genitalia, ventral view. H, male hypopygium, dorsal view. I, abdominal coloration male (left), female (right).

Legs. Coloration as in the male. There were 10.5 (8-13) sensilla chaetica on basal $1/3$ ($1/5$ - $5/12$) of mid tarsi 1, and 10 (7-13) on basal $1/4$ ($1/6$ - $1/2$) of hind tarsi 1.

Abdomen. General colour pattern more or less as in the male but lighter. Tergite I yellow, II brown with basal $1/5$ - $1/3$ yellow, III brown with more or less distinct posterior pale band, IV-V mostly yellow with a narrow, posterior, brown band, VI brown with basal $1/3$ yellow, VII brown yellowish or paler on anterior half, VIII brown with a narrow, light, anterior band. On tergites III-IV median setae in double row at least posteriorly, not numerous; lateral setae uniserial; transverse, uniserial row of setae present posteriorly. Tergal chaetotaxy:

	median setae	lateral setae
Tergite III	3.7 (3-5)	9.2 (7-13)
Tergite IV	3.3 (2-6)	8.4 (6-11)

Genitalia. Cerci white. Spermathecae dark brown, roundish, oval, or more or less reniform, 101 (87-113) μm long. Spermathecal ducts S-shaped. Lateral sternites of abdominal segment IX well developed.

PUPA (Fig. 9)

Colour: exuvia brownish, paler on abdominal segments I, VII, VIII, darker on cephalothorax.

Length of the exuvia (mm) 3.7 (2.5-4.2); cephalothorax 1.3 (1.2-1.5); abdomen 2.7 (2.2-3.8).

Cephalothorax. Anterior part of notum weakly wrinkled along the eclosion line. Pronotal horn transparent, sharp, covered by spinules on apical $2/3$, 122 (93-136) μm long, 24 (19-30) μm wide. Prothoracic horn ratio 5.08 (4.10-6.94). Frontal tubercle absent; frontal setae, 90 (70-113) μm , present on the frontal plate below the middle of the base of the antenna.

Abdomen. Anal lobe length 230 (217-261) μm ; longest anal setae length 146 (139-157) μm . Pedes spurii B present on abdominal segment II weak on III. Setae present on abdominal segments I-VIII:

	I	II	III	IV	V	VI	VII	VIII
dorsals	4	4	4	4-5	4-5	4-5	5	1
laterals	1	2	3	3	3	3	3	5
ventrals	0	3	3	3	3	3	3	0

Tergites: I bare; II with a transverse patch of 93.9 (82-112) recurved hooks, biserial; a very small, spine patch on each side, anterior to the extremity of the hook patch and sometimes another supplementary patch anteriorly, mediad; III-V with three, spine patches: anterior patch reniform, median patch transverse, well separated from anterior patch, but close to posterior transverse patch, VI with a large anterior and a small posterior, spine patch divided in three parts; VII-VIII covered by shagreen patches on the anterior $1/3$.

LARVA (Fig. 9)

Fourth-instar larva (exuvia) 3.2-5.2 mm long. Head capsule brownish, darker laterally and posteriorly. Body greenish.

Antenna 70 (61-93) μm long, 0.48 (0.39-0.65) as long as mandible, 5.43 (4.67-6.00) times as long as wide. Lauterborn's organs large, antennal blade

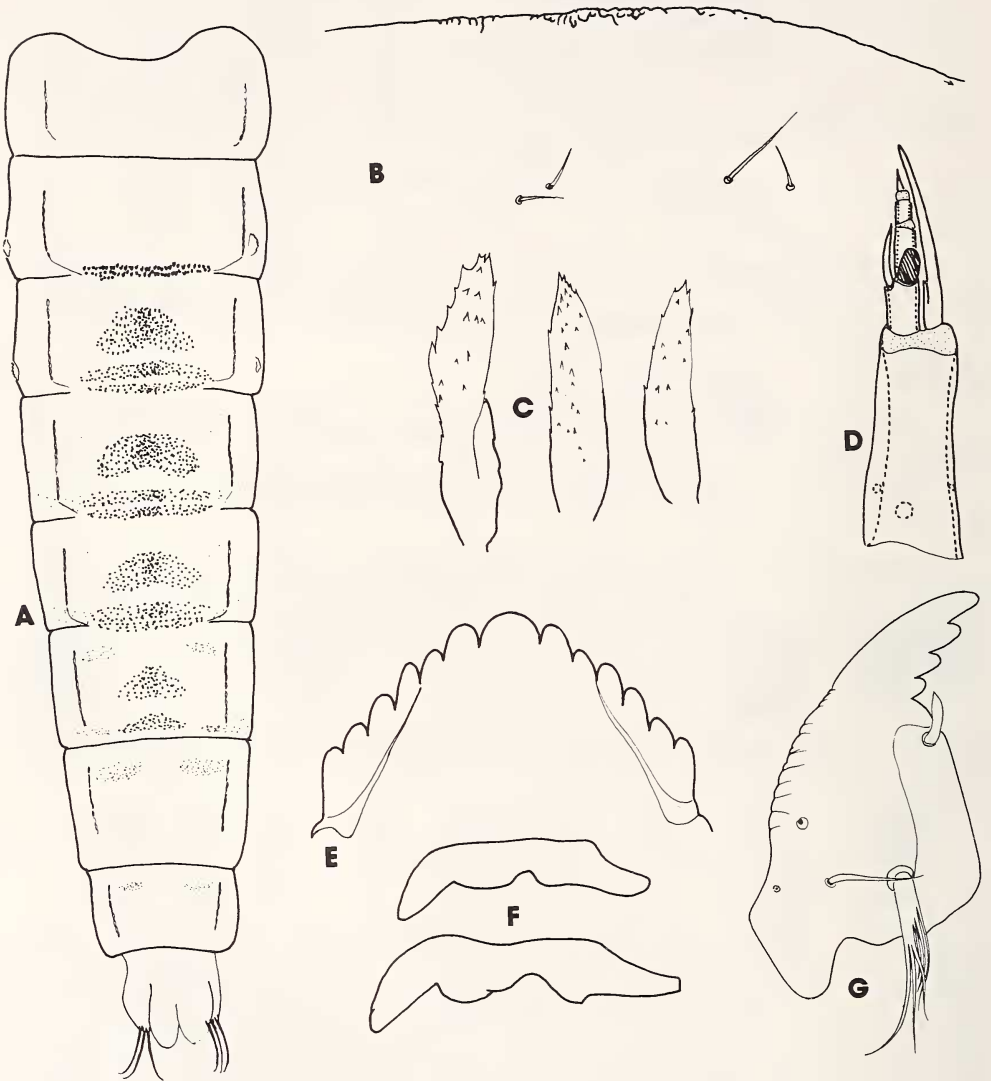


FIG. 9. *Cricotopus triannulatus* (Macquart), pupa A-C, larva D-G. A, ornamentation of pupal exuviae, dorsal view. B, ornamentation along eclosion line and dorsocentral setae. C, prothoracic horn, variation. D, antenna. E, hypostomium, ventral view. F, premandible, variation. G, antenna.

extending to or beyond the apex of antennomere 5, accessory setae to about half of antennomere 3 and sensory seta to the apex of 3. Labral setae SI bifurcated. Epipharynx with four chaetulae laterales and two chaetulae basales; pecten with three small setae.

Premandible simple, brownish, sometimes darker on apical half. Distal part of the mandible dark brown to black, inner margin smooth, outer edge with strong crenulations.

Hypostomium 129 (111-148) μm wide, 77 (70-93) μm long. Hypostomial ratio 0.59 (0.52-0.65). Median tooth and the first two, lateral teeth slightly paler than remaining lateral teeth. Median tooth generally evenly convex 1.84 (1.40-3.00) wider than the first lateral tooth. First lateral tooth rounded, distinctly larger, and separated from the second lateral tooth; lateral teeth 3-6 generally regularly decreasing in size, or about the same size.

Anal gills sausage-shaped. Claws on anterior prolegs and posterior pseudopods about the same brown colour. Lateral hair tuft on abdominal segment I-VI moderately developed 92 (57-114) μm .

Remarks. The colour pattern of the abdomen, with tergites IV-V partly light, separate adults of this species from the others; male and female genitalia are also distinctive. The immatures have the general habitus of those in the *tremulus* group; the presence of frontals, its smaller size and the reniform shape of the anterior, spine patch of tergites II-V, distinguish this species. In the larva, the hypostomium of *C. triannulatus* resembles that of *C. slossonae* but differs from the latter by its larger, second lateral tooth. *C. triannulatus* and *C. infuscatus* are virtually impossible to separate only on the shape of the hypostomium; however the basal portion of the mandible is yellow in this species but distinctly brownish in *C. infuscatus*.

This species is known from North America under the name of *Cricotopus exilis* Johannsen. The type specimen of *C. exilis* as well as the material from Salem Creek correspond to the description of the European species *C. triannulatus* (Macquart) and the name *Cricotopus exilis* Johannsen is placed in synonymy. This species is reported for the first time in Ontario.

Distribution. Reported in North America sub *Cricotopus exilis* Johannsen for EASTERN NORTH AMERICA (Sublette & Sublette 1965, 1971).

Material examined. On slide: ONTARIO, Salem Creek, 7 δ δ , 13 ♀ ♀ , 20.V-7.X.1976; 15 δ δ , 19 ♀ ♀ , 5.V-17.X.1967; 2 δ δ , 5-11.V.1978. Associated larva-pupa-adult: Conestogo, Conestogo River, 19.V.1978 (1 δ), 19.V.1978 (1 δ); Elmira, Salem Creek 10.V.1978 (2 ♀ ♀), 29.V.1978 (1 δ). Waterloo, Laurel Creek, 6.V.1978 (1 δ), 8.V.1978 (1 δ), 11.V.1978 (2 δ δ), 12.V.1978 (1 δ). In alcohol, Elmira, Salem Creek, about 1050 δ δ , 2960 ♀ ♀ from May 1976 to November 1978. Originally described as *Cricotopus exilis* Johannsen, holotype male, No. 2343, Ithaca, New York, no date. Specimen with a sub-slide of genitalia and antenna deposited in the Cornell University Collection, Ithaca.

***Cricotopus (Cricotopus) infuscatus* (Malloch)**

Orthocladus (Trichocladus) infuscatus Malloch 1915:517 (original description, male).

Cricotopus infuscatus (Malloch), Johannsen in Johannsen & Townes, 1952:17 (key, adults): Sublette, 1970:62 (redescription, male): Sublette & Sublette, 1971:101 (key, male).

MALE (Fig. 10)

Length 3.1 (2.9-3.6)mm; thorax 1.0 (0.9-1.1) mm; abdomen 2.1 (1.9-2.5) mm.

Thorax. Shining. Mesonotal band sharply contrasting on the yellowish ground colour of thorax, which is infuscated with brown in dark specimens.

Wings. Transparent, with pale brownish tint. Length 1846 (1717-1959) μm , width 568 (505-626) μm . Setae: first axillary sclerite with one seta; squama 10.8 (8-20); vein R 6.1 (4-8); R_1 0; R_{4+5} 0. Anal lobe varying from weakly produced to rectangularly obtuse, generally not produced however.

Legs. No light ring on fore tibia; dark brown mid and hind tibiae with a more or less distinct pale ring, proximal and apical, dark-brown band about equal in size. All fore tarsi dark brown; mid and hind tarsi brown, paler than on fore legs, however. Sensilla chaetica, 8 (6-9) on basal 1/5 (1/4-1/8) of fore tarsi 1 only.

Abdomen. All tergites brown, II-VI more or less distinctly paler on anterior half, VI-VII generally with a pale band on posterior 1/4. Distribution of abdominal setae extremely variable. On tergites III-IV median setae in two groups, instead of in a double row, with a tendency toward an anterior transverse row; lateral setae more or less distinctly biserial; transverse uniserial to biserial row of setae present posteriorly. In some specimens, quite distinctive, anterior and posterior, transverse rows of setae are present, with lateral setae more or less dispersed, or serial. Tergal chaetotaxy:

	median setae	lateral setae
Tergite III	7.6 (2-12)	15.3 (12-20)
Tergite IV	8.9 (4-13)	18.7 (13-26)

Hypopygium. Brown. Gonocoxite length 205 (191-226) μm , gonostylus length 74 (65-87) μm . Anal point absent. Posterior part of basal lobe biramous directed obliquely backwards with several, small, marginal setae, anterior part more or less perpendicularly directed inwards with few, stronger, marginal setae. Inner edge of gonostylus well developed, apically produced in a triangular process. Apical spine strong.

FEMALE (Fig. 10)

Length 3.2 (2.6-3.7) mm; thorax 1.0 (0.9-1.2) mm; abdomen 2.2 (1.7-2.4) mm.

Antenna. Preapical seta present 164 (139-209) μm .

Thorax. Shining. Coloration as in the male, but distinctly lighter: mesonotal bands sharply contrasting on the yellowish, ground colour.

Wings. Transparent, with a pale, brownish tint. Length 1955 (1717-2303) μm , width 709 (646-788) μm . Setae: first axillary sclerite with 1 seta; remigium 1; squama 10.6 (8-13); vein R 9.2 (7-11); R_1 4.7 (3-8); R_{4+5} 5.0 (4-6) distal. Anal lobe rectangularly obtuse.

Legs. Coloration as in the male. There were 11.6 (7-16) sensilla chaetica on basal 1/3 of fore tarsi 1 and 13.3 (11-19) on 1/4-1/5 of hind tarsi 1.

Abdomen. Coloration similar to that of the male, but generally with a pale band on posterior 1/5-1/7 of tergites II-VII. Abdominal coloration in teneral or young adults very pale varying from yellowish or greenish to pale brown or a more

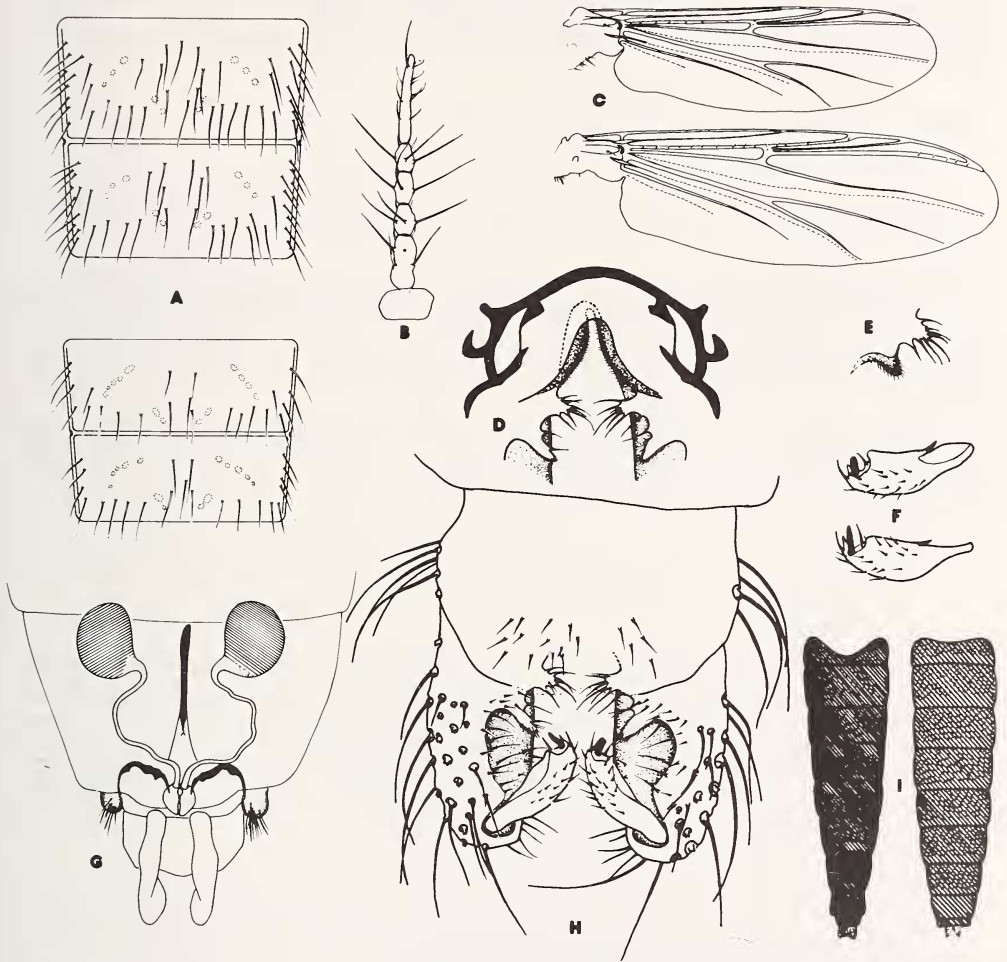


FIG. 10. *Cricotopus infuscatus* (Malloch), imagines. A, chaetotaxy on abdominal tergites III-IV of the male (upper), and the female (lower). B, antenna, female. C, wing, male (upper), female (lower). D, male hypopygium, ventral view. E, male gonostylus, variation. F, basal lobe of gonocoxite, variation. G, female genitalia, ventral view. H, male hypopygium, dorsal view. I, abdominal coloration, male (left), female (right).

or less infuscated pattern. On tergites III-IV median setae biserial; lateral setae uniserial; transverse, uniserial, row of setae present posteriorly. Tergal chaetotaxy:

	median setae	lateral setae
Tergite III	5.2 (4-11)	10.4 (7-13)
Tergite IV	5.3 (4-10)	10.3 (7-12)

Genitalia. Cerci whitish with greenish tint plus a more or less distinct brown infuscation. Spermathecae more or less rounded 87 (61-113) μm long, 79 (61-96) μm wide. Spermathecal ducts S-shaped. Lateral sternites of abdominal segment IX moderately developed.

PUPA (Fig. 11)

Colour: brownish.

Length of the exuvia (mm) 4.7 (3.6-4.9), cephalothorax 1.3 (1.1-1.5), abdomen 3.1 (2.5-3.4).

Cephalothorax. Anterior part of notum nearly smooth, weakly wrinkled along the eclosion line. Pronotal horn, transparent, mostly covered by spinules, 125 (91-152) μm long, 27 (16-36) μm wide. Prothoracic horn ratio 4.83 (2.93-7.22). Frontal tubercule absent; frontal setae, 84 (70-130) μm , on the frontal plate, present below the middle of the base of the antenna.

Abdomen. Anal lobe length 289 (243-322) μm , longest anal seta length 148 (122-174) μm . Pedes spurii B present on abdominal segment II and very weak on III. Setae present on abdominal segments I-VIII:

	I	II	III	IV	V	VI	VII	VIII
dorsals	3	4	4	4	4	5	5	1
laterals	1	2	3	3	3	3	3	5
ventrals	1	3	3	3	4	4	4	0

Tergites: I bare; II usually with only a posterior, transverse patch of 99.5 (92-112) recurved spines, biserial but sometimes with an extra small, transverse, spine hatch anteriorly; III-V with three spine patches; anterior patch larger, more or less reniform well-separated from median and posterior, transverse patches, which are close to one another; VI with a large, anterior, reniform spine patch and a posterior, elongated, transverse patch usually divided in three parts; VII-VIII with a patch of shagreen on each side of basal 1/3.

LARVA (Fig. 11)

Fourth-instar larva (exuvia) 3.6-6.6 mm long. Head capsule brownish somewhat darker posteriorly and laterally; body greenish.

Antenna 63 (51-71) μm long, 0.41 (0.35-0.45) as long as mandible, 4.22 (3.75-5.00) times as long as wide. Lauterborn's organs well developed, rather large, antennal blade extending beyond or to the apex of antennomere 5, accessory seta to the basal 1/3 of antennomere 3 and sensory seta to the apex of 3 or base of 4. Antennal ratio 0.55 (0.43-0.66). Labral setae SI bifurcated. Epipharynx with four chaetulae laterales and two chaetulae basales; pecten with three small setae.

Premandible simple, large at base, brown, darker on apical half in some specimens. Distal part of the mandible dark brown to black, basal part brownish, inner margin smooth, outer edge somewhat sinuate, with strong crenulations.

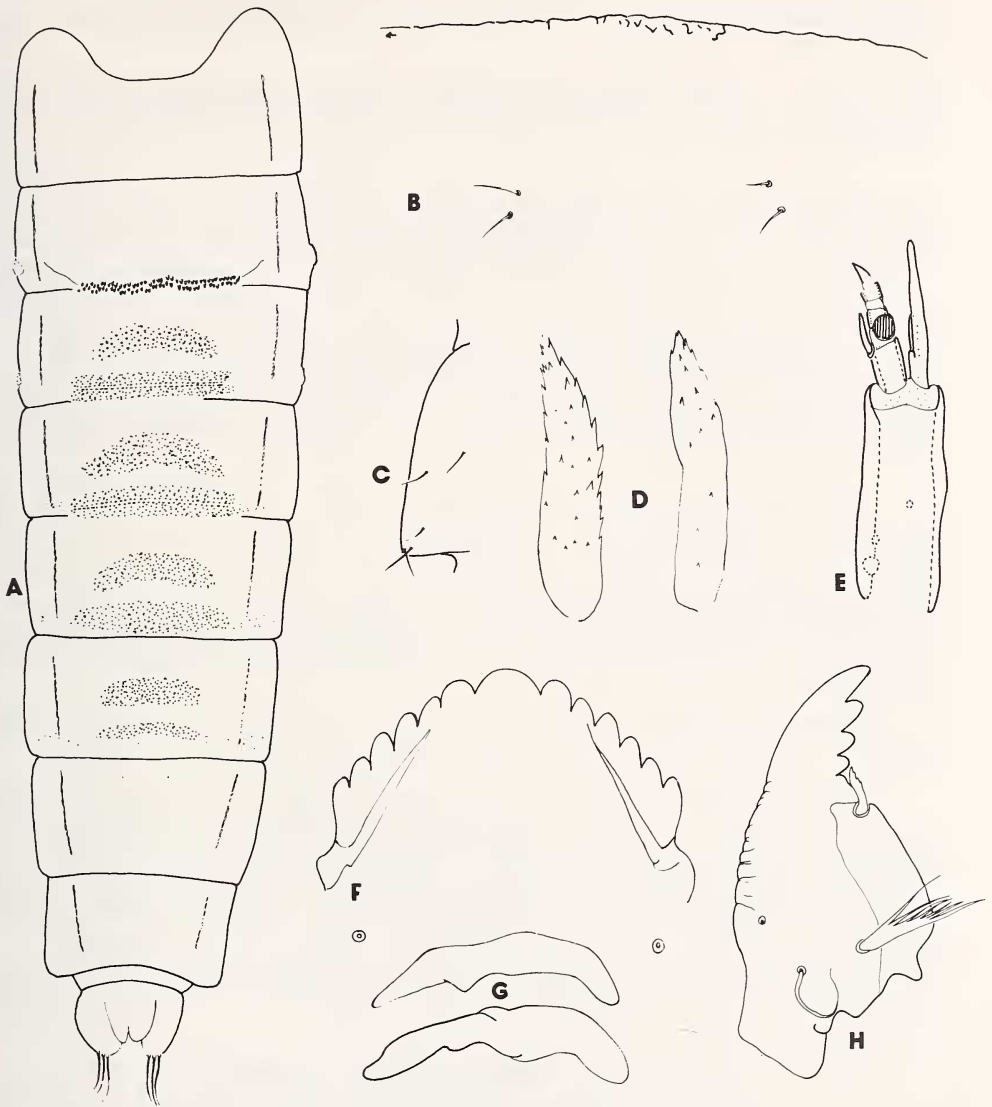


FIG. 11. *Cricotopus infuscatus* (Malloch), pupa A-D, larva E-H. A, ornamentation of pupal exuvia, dorsal view. B, ornamentation along eclosion line and dorsocentral setae. C, lateral setae on abdominal tergite VIII. D, prothoracic horn, variation. E, antenna. F, hypostomium, ventral view. G, premandible, variation. H, mandible.

Hypostomium 142 (130-159) μm wide, 79 (68-84) μm long. Hypostomial ratio 0.56 (0.50-0.61). Median tooth and the first two, lateral teeth indistinctly paler than the remaining teeth. Median tooth convex 1.86 (1.50-2.20) as wide as the first lateral tooth. First, lateral tooth rounded, distinctly separated from the second, lateral tooth, and about twice as large. Lateral teeth 3-6, triangular, and regularly decreasing in size.

Anal gills sausage-shaped. Pseudopodal claws and anterior proleg claws about the same size. Lateral hair-tufts on abdominal segments I-VI well developed 132 (102-159) μm long.

Remarks. *Cricotopus infuscatus* was the only medium to large species with infuscated abdomen and dark brown, mesonotal bands sharply contrasting with the yellowish, ground colour of thorax, and with light ring absent on fore tibiae. Furthermore, males and females have distinctive brownish genitalia. The pupa which has the general habitus of those of the *tremulus*- group is readily separated from other members of the group by the presence of frontals, its larger size and the shape of the anterior, spine patch on tergites III-V which is more elongated than in *C. triannulatus*. The larva of *C. infuscatus* can be separated from that of other species by the stronger, second lateral tooth of the hypostomium and the crenulated outer edge of the mandible which is also distinctly brownish basally, not yellow as in *C. triannulatus*.

This species does not fit exactly into any of the species groups given by Hirvenoja (1973). The female and immatures readily key out to the *tremulus*-group but the male keys to the *fuscus* group on the basis of its multiserial lateral setae on the abdomen, and its numerous median setae irregularly distributed. Nevertheless, the biramous basal lobe of the gonocoxite is well developed as in most members of the *tremulus*- group; *C. infuscatus* probably belongs here while showing some relation to the *fuscus*- group. This species is reported for the first time in Ontario.

Distribution. Reported from: CENTRAL U.S. (Sublette & Sublette 1965, 1971).

Material examined. Holotype male, slide no. 3059, Peoria, Illinois, October 22, 1914, at light (C. A. Hart). In the Illinois Natural History Survey Collection, Urbana. On slide: ONTARIO, Elmira, Salem Creek, 8 δ δ , 21.V-11.X.1976; 10 δ δ , 12 \varnothing \varnothing , 29.V-22.X.1977; 5 δ δ , 24.V.1978. Associated larva-pupa-adult: Elmira, Canagagigue River Lower East, 4.V.1976, K. Dance (1 δ); Elmira, Canagagigue River 22.V.1978 (1 δ , 2 \varnothing \varnothing); Elmira, Salem Creek 11.V.1978 (1 \varnothing), 22.V.1978 (1 \varnothing), 30.V.1978 (1 \varnothing); Conestogo, Conestogo River 20.V.1978 1 δ , 2 \varnothing \varnothing ; Waterloo, Laurel Creek 12.V.1978 (1 \varnothing). In alcohol: Elmira, Salem Creek, about 260 δ δ , 1020 \varnothing \varnothing from May to October 1978.

***Cricotopus (Cricotopus) politus* (Coquillett)**

Orthocladius politus Coquillett, 1902:93 (original description, male).

Orthocladius politus Coquillett, Johannsen, 1905:268 (redescription, male).

Trichocladius politus (Coquillett), Johannsen, 1908:283 (redescription, adults): Malloch 1915:516 (redescription, adults).

Cricotopus politus (Coquillett), Johannsen in Johannsen & Townes, 1952:17 (key, adults).

Orthocladius politus Coquillett [*Cricotopus politus* (Coquillett)], Sublette, 1966b: 593 (redescription, male).

MALE (Fig. 12)

Length. 3.2 (2.7-3.7) mm; thorax 0.9 (0.8-1.1) mm; abdomen 2.3 (1.9-2.6) mm.

Thorax. Shining. Mesonotal bands, sharply contrasting on the yellow ground colour.

Wings. Transparent, brownish. Length 1830 (1616-2020) μm , width 608 (525-768) μm . Setae: first axillary sclerite with one seta; remigium 1; squama 8.7 (8-11); vein R 4.7 (2-6) proximal; R_1 0; R_{4+5} 0. Anal lobe slightly produced or rectangular.

Legs. Femora brown yellow on basal. No light ring on tibiae; fore tibiae brown, mid and hind tibiae brownish; tarsi with similar coloration. Sensilla chaetica not numerous 1.3 (1-3) on the basal 1/25 of mid tarsi 1 and 5.6 (4-8) on basal 1/8-1/5 of fore tarsi 1.

Abdomen. Strongly shining. Tergites brownish yellow becoming darker toward the apex with a distinct greenish tint; somewhat paler on anterior 1/4-1/2 of tergites II-VII. On tergites III and IV median setae more or less distinctly in double row; lateral setae uniserial on each side; also forming a transverse row posteriorly as well as another transverse row near the middle of tergites in line with the anterior median setae. Tergal chaetotaxy:

	median setae	lateral setae
Tergite III	6.5 (4-9)	12.1 (10-15)
Tergite IV	6.1 (4-7)	12.8 (8-13)

Hypopygium brownish. Length of gonostylus 70 (61-78) μm , length of gonocoxite 195 (165-235) μm . Anal point absent. Basal lobe well developed curved backwards. Inner, convex edge of gonostylus strongly triangular.

FEMALE (Fig. 12)

Length 2.8 (2.2-4.0) mm; thorax 1.0 (0.8-1.1) mm; abdomen 1.8 (1.5-2.3) mm.

Antenna. Apical seta present 70 (61-80) μm .

Thorax. Coloration as in the male. However, preepisternum II is yellowish ventrally with two, brown, anterior spots and a brown stripe laterally.

Wings. Transparent, brownish. Length 1927 (1717-2060) μm , width 729 (646-788) μm . Setae: first axillary sclerite with one seta; remigium 1; squama 9.3 (8-11); vein R 10 (7-13); R_1 2.8 (1-6); R_{4+5} 4.4 (3-6) distal. Anal lobe not produced, obtuse.

Legs. Coloration as in the male. There were 10.2 (8-13) sensilla chaetica on basal 1/4 of mid tarsi 1 and 6.8 (6-9) on basal 1/5 of hind tarsi 1.

Abdomen. Coloration as in the male but somewhat lighter, sometimes whitish or pale greenish. On tergites III-IV median setae more or less distinctly in double row; lateral setae uniserial on each side, and also forming two transverse rows, one posterior and one near the middle including the anterior, median setae. Tergal chaetotaxy:

	median setae	lateral setae
Tergite III	4.8 (4-6)	8.9 (7-15)
Tergite IV	5.1 (4-8)	10.6 (8-16)

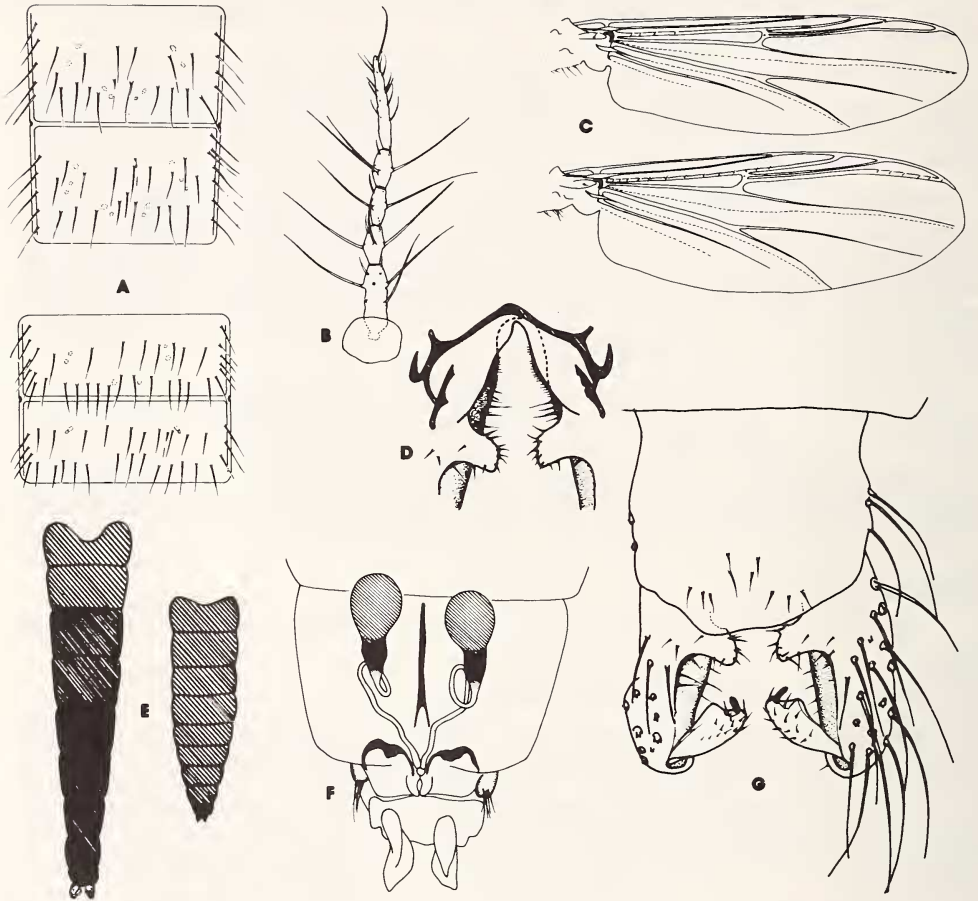


FIG. 12. *Cricotopus politus* (Coquillett), imagines. A, chaetotaxy on abdominal tergites III-IV of the male (upper), and the female (lower). B, antenna, female. C, wing, male (upper), female (lower). D, male hypopygium, ventral view. E, abdominal coloration, male (left), female (right). F, female genitalia, ventral view. G, male hypopygium, dorsal view.

Genitalia. Cerci white or sometimes with a brownish tint. Spermathecae pear-shaped; bulbous part translucent, neck dark brown. Spermathecal duct with a complete loop. Lateral sternites of abdominal segment IX moderately developed.

PUPA (Fig. 13)

(n=3). Colour of the exuvia pale brown gradually becoming paler posteriorly.

Length of the exuvia (mm) 2.1 (1.9-2.2), cephalothorax 0.6 (0.6-0.7), abdomen 1.4 (1.3-1.5).

Cephalothorax. Anterior and median part of notum granular in a narrow band along eclosion line. Pronotal horn transparent with a brownish tint and numerous spinules on apical half 487 (470-513) μm long, 61 (52-70) μm wide. Prothoracic horn ratio 8.1 (7.4-9.2). Frontal tubercule and frontal setae absent. A small patch of granulations on the inner edge of pedicel.

Abdomen. Length of anal lobe 252 (235-287) μm ; length of the longest anal seta 136 (130-139) μm . Pedes spurii B robust, present on segments II and III. Setae present on abdominal segments I-VIII.

	I	II	III	IV	V	VI	VII	VIII
dorsals	3	4	4	5	5	5	5	1
laterals	3	3	3	3	3	3	4	5/(?3)
ventrals	1	2-3	2-3	3-4	3-4	3-4	4	0

Tergites: I bare, II with an anterior small, spine patch, a large, elongated, spine patch and a transverse patch of 56.3 (53-58) recurved spines biserial; III-V with three, well-spaced, spine patches, anterior patch triangular, increasing in size from III to V, median patch elongated covering about 2/3 segment width and well separated from anterior patch, posterior patch transverse, linear and close to median patch and along the segment posterior margin; VI with a large, oval, anterior, spine patch bordered by shagreen patch on each side, and a small, elongated, posterior, spine patch, both well separated; VII-VIII with two, anterior, shagreen patches.

LARVA (Fig. 13)

(n=2). Fourth-instar larva (exuvia) 4.0 5.0 mm long. Head capsule yellowish with a brownish tint.

Antenna 77-82 μm long, 0.53 as long as mandible, 4.86-5.14 times as long as wide. Lauterborn's organs small, antennal blade extending beyond the apex of antennomere 5, accessory seta to the basal 1/3 of antennomere 3, and sensory seta until 2/3 of antennomere 3. Antennal ratio 0.73-0.75.

Labral setae SI bifurcated. Epipharynx with five chaetulae laterales and two chaetulae basales; pecten with three small setae.

Premandible simple. Distal part of the mandible dark brown to black with smooth inner margin and smooth outer edge.

Hypostomium 123-134 μm wide, 64-73 μm long. Hypostomial ratio 0.52-0.54. Median tooth and first two, lateral teeth somewhat paler by transmitted light. Median tooth 2.00-2.33 as wide as the first lateral tooth. Lateral teeth 1-6 more or less regularly decreasing in size; however, the first, lateral tooth is partly fused with median tooth.

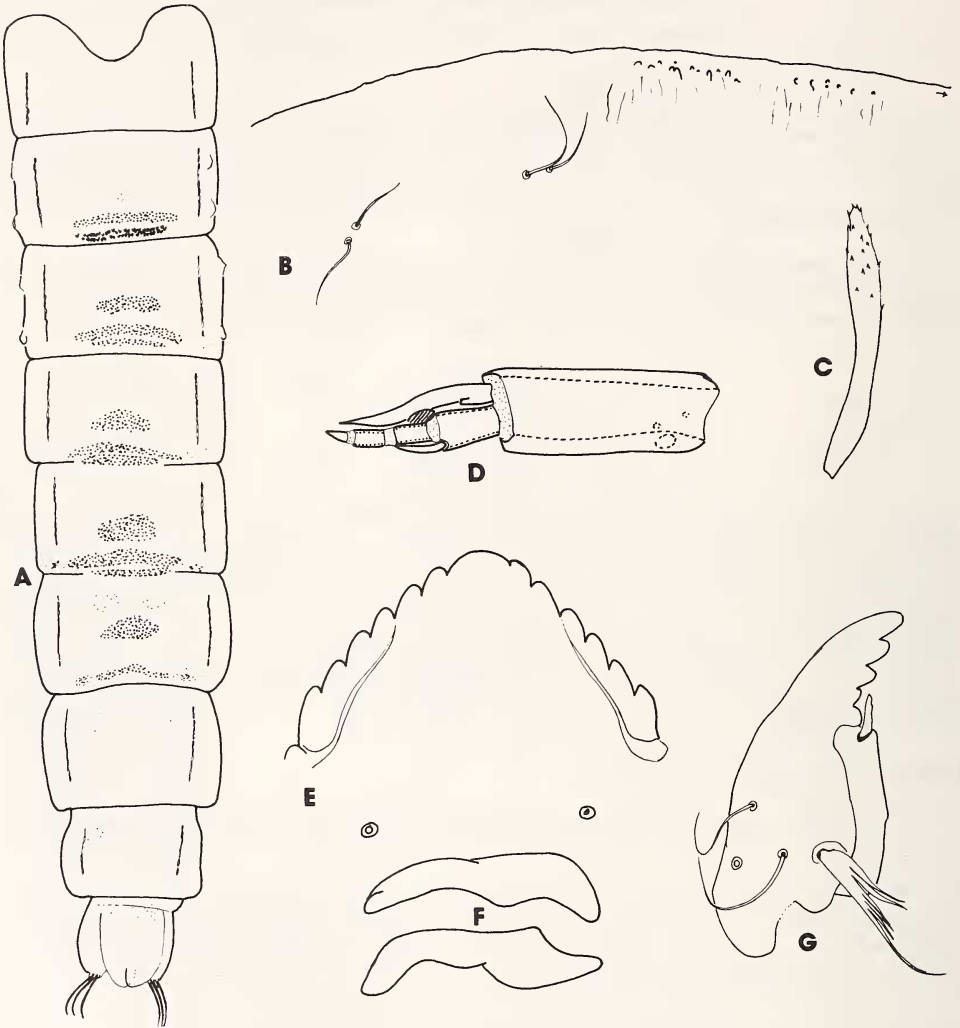


FIG. 13. *Cricotopus politus* (Coquillett), pupa A-C, D-G. A, ornamentation of pupal exuvia, dorsal view. B, ornamentation along eclosion line and dorsocentral setae. C, prothoracic horn. D, antenna. E, hypostomium, ventral view. F, premandible, variation. G, mandible.

Anal gills sausage-shaped. Brown claws on anterior pseudopods. Lateral hair-tufts on abdominal segments I-VI reduced 23-45 μm .

Remarks. The adults of this species have a very distinctive colour pattern and unique male and female genitalia. In the pupa, the presence of a transverse, spine patch in front of the patch of recurved spines on tergite II readily separates this species from others. The hypostomium with lateral teeth about the same size and the smooth, outer edge of the mandible are two characters which distinguish this larva from the others.

The Nearctic *C. politus* is closely related to the European species of the *cylindraceus*- group and to a lesser extent to the *fuscus*- group. In the male, the anterior, transverse row of setae on the tergites is present as in the males of the *cylindraceus*- group but the basal lobe of the gonocoxite is not notched as in typical species. The female (associated with the male by its similar abdominal chaetotaxy and similar emergence) has the pear-shaped spermathecae of the *fuscus*- group. In the pupa, the frontal setae are absent, but present on the prefrons in the *cylindraceus*- group, and the lateral setae (1+) on segment VIII are well developed but weak in the *cylindraceus*- group. The larva has a hypostomium with a broad, median tooth and subequal, lateral teeth, but in *C. politus* the antennal ratio is distinctly greater, 0.73-0.75, than in the *cylindraceus*- group, $P < 0.5$. For these reasons, it would be reasonable to place *C. politus* in a group of its own, somewhat linked to the European *cylindraceus* and *fuscus*- groups. The species is reported for the first time in Ontario.

Distribution. Reported from COLORADO and FLORIDA to NEW YORK (Sublette & Sublette 1965, Sublette 1967b).

Material examined. Holotype male, number 6174, Washington, D.C. 6.6, H. S. Barber. In the U.S. National Museum Collection, Washington. On slide: ONTARIO: Elmira, Salem Creek, 3 $\delta \delta$, 8-22.VIII.1976; 9 $\delta \delta$, 10 $\text{♀} \text{♀}$ 22.V-5.IX.1977; 3 $\delta \delta$, 25.V-1.VI.1978. 1 pupa (exuvia) 3.VI.1978. Associated larva-pupa-adult Elmira, Salem Creek, 31.V.1978 (2 $\delta \delta$). In alcohol: Elmira, Salem Creek, about 35 $\delta \delta$, 30 $\text{♀} \text{♀}$ from May 1976 to September 1978.

Cricotopus (Cricotopus) luciae n.sp.

MALE (Fig. 14)

Length. 3.5 (3.3-3.9) mm; thorax 1.2 (1.1-1.3) mm; abdomen 2.3 (2.2-2.5) mm.

Thorax. Shining. All thoracic sclerites and ground colour strongly dark brown; antepnotum, postpronotum, space in front and ventral to lateral mesonotal bands and dorsal half of preepisternum II somewhat paler in some specimens.

Wings. Transparent, with a pale brownish tint. Length 2325 (2182-2464) μm , width 701 (646-768) μm . Setae: first axillary sclerite with one seta; remigium one; squama 19.1 (15-24), vein R 9 (7-11), R_1 0, R_{4+5} 0. Costa moderately produced beyond R_{4+5} . Anal lobe moderately produced.

Legs. Fore leg more or less distinctly darker than mid and hind legs. No light ring on tibiae except an indistinct, paler fascia in the middle. Tarsi dark brown, darkest on fore legs. Sensilla chaetica, 7.4 (4-13) on basal 1/6-1/4 of hind tarsus I.

Abdomen. Tergites dark brown throughout; VI-VII with posterior 1/5-1/7 paler, similar pale band sometimes visible in III-VII, with posterior 2/3 on VII

paler in some specimens. On tergites III-IV median setae generally arranged in a short, transverse row anteriorly; lateral setae more or less biserial; transverse row, uni- to biserial, present posteriorly. Tergal chaetotaxy:

	median setae	lateral setae
Tergite III	9.8 (6-13)	23 (12-29)
Tergite IV	11 (6-14)	21.9 (10-26)

Hypopygium. Brown. Length of gonocoxite 249 (226-261) μm , length of gonostylus 98 (87-104) μm . True anal point absent but posterior margin of tergite IX medially acuminate. Basal lobe finger-shaped, bare. Inner lobe of gonostylus strongly developed. Apical spine robust and short.

FEMALE (Fig. 14)

Length. 3.4 (2.9-3.9) mm; thorax 1.2 (1.1-2.3) mm; abdomen 2.2 (1.7-2.7) mm.

Antenna. Preapical seta present, 55 (52-57) μm long, fragile, missing on eight specimens.

Thorax. Shining. Coloration as in the male but distinctly lighter; the ground colour which is pale brown to brown not dark brown as in the male. Space in front and ventral to lateral mesonotal bands, antepronotum, postpronotum brownish.

Wings. Transparent, with a weak brownish tint, finely punctuate. Length 2285 (2060-2525) μm , width 875 (747-990) μm . First axillary sclerite with one seta; remigium one; squama 16 (13-20); vein R 14 (12-18); R_1 6.7 (4-10); R_{4+5} 6.7 (5-8) distal. Costa moderately projected beyond R_{4+5} . Anal lobe moderately produced.

Legs. Coloration as in the male. There are 5.8 (4-7) sensilla chaetica on basal 1/5 of mid tarsi 1 and 16.9 (14-20) on basal 1/3 of hind tarsi 1.

Abdomen. Coloration as in the male, becoming somewhat darker toward apex. Pale bands, when present, very narrow. On tergites III-IV median setae not numerous, present only on posterior half; lateral setae grouped posteriorly, more or less uniserial; transverse row, uni- to biserial, present posteriorly. Tergal chaetotaxy:

	median setae	lateral setae
Tergite III	6.5 (5-10)	14.1 (10-20)
Tergite IV	8.1 (6-12)	14 (8-19)

Genitalia. Cerci brownish. Spermathecae dark brown, roundish 71 (61-78) μm long. Spermathecal ducts strongly curved. Lateral sternites of abdominal segment IX weakly to moderately developed.

IMMATURE STAGES: unknown.

Remarks. This large, brown species lacks white rings on the fore legs. The male hypopygium is very distinctive with finger-shaped, basal lobe, and females have a posterior, transverse row of setae on abdominal tergites, small, round spermathecae and S-curved spermathecal ducts.

This species does not fit in any species-group defined by Hirvenoja (1973) and the male and female genitalia are unique among known *Cricotopus* species. Without the immature stages it is difficult to place *C. luciae* within the genus. The



FIG. 14. *Cricotopus luciae* n.sp., imagines. A, chaetotaxy on abdominal tergites III-IV of the male (upper), and the female (lower). B, antenna, female. C, wing, male (upper), female (lower). D, male hypopygium, dorsal view, holotype. E, male gonostylus, variation. F, basal lobe of gonocoxite, variation. G, female genitalia, ventral view, allotype. H, abdominal coloration, male (left), female (right). I, male hypopygium, dorsal view, holotype.

chaetotaxy of the abdomen—incomplete, anterior, transverse row of setae in the male, and lateral setae located far from the lateral and posterior margins—indicates that this species is relatively close to *C. politus* (Coquillett) and to the *cylindraceus*-group. The creation of a new species-group to include this species seems appropriate but it can only be placed definitively within the genus with the discovery of the immatures.

Distribution. At present known only from southern Ontario but is probably more widely distributed.

Type material. Holotype male, ONTARIO: Elmira, Salem Creek, in emergence trap T 11, between 25.V-1.VI.1978, L. LeSage. Allotype female same data. Paratypes, same locality 7 ♂♂, 3 ♀♀, 18.V-9.X.1976; 15 ♂♂, 10 ♀♀, 3.V-11.V.1977; 4 ♂♂, 2 ♀♀, 18.V-1.VI.1978. In alcohol: 6 ♂♂, 18 ♀♀, 20.V-13.X.1977; 6 ♂♂, 5 ♀♀, 6.V-13.IX.1977; 13 ♂♂, 8 ♀♀, 18.V-18.X.1978. Conestogo, Conestogo River. Swarm E 295, 2 ♂♂. Holotype and allotype in the Canadian National Collection (CNC). Paratypes in the CNC, in the Collection entomologique de l'Université de Montréal, and in the first author's collection.

Cricotopus (Cricotopus) festivellus (Kieffer)

Chironomus festivellus Kieffer, 1906:18 (original description, male).

Cricotopus (Cricotopus) festivellus (Kieffer), Hirvenoja, 1973:225 (description, key, adults, pupa, larva).

MALE (Fig. 15)

Length. 2.9 (2.7-3.3) mm; thorax 0.9 (0.8-1.0) mm; abdomen 2.0 (1.8-2.4) mm.

Thorax. Shining. Mesonotal bands not contrasting with the brown ground colour of the space between them.

Wings. Transparent, with pale brownish tint. Length 1711 (1596-1858) μm , width 545 (505-606) μm . Setae: first axillary sclerite with one seta; remigium one; squama 6.7 (4-9); vein R 2.6 (2-4) proximal; R_1 0, R_{4+5} 0. Anal lobe not produced, obtuse.

Legs. Pure white ring on fore tibia, apical dark brown band about twice as large as the basal dark band; pale brown ring more or less distinct present on mid and hind tibiae. All tarsi brown, but darker on fore legs. There are 3.4 (3-5) sensilla chaetica on basal 1/7 (1/5-1/8) of mid tarsi 1 and 5.7 (5-7) on basal 1/6-1/12 of hind tarsi 1.

Abdomen. Tergites I yellow, II-III almost dark brown or with anterior 1/4-1/8 yellow, and posterior narrow yellow band, IV dark brown on anterior 1/3 and yellow on posterior 2/3, V brown with more or less distinct pale 1/4 anterior band, VI-VII dark brown with more or less distinct pale, narrow, anterior and posterior bands, VIII wholly dark brown. Chaetotaxy:

	median setae	lateral setae
Tergite III	2.2 (2-3)	5.3 (4-7)
Tergite IV	2.3 (2-4)	5.7 (5-7)

Hypopygium. White. Length of gonocoxite 180 (165-191) μm , length of gonostylus 64 (52-70) μm . Anal point absent. Basal lobe large, bent backwards, covered by long setae. Inner edge of gonostylus well developed.

FEMALE (Fig. 15)

Length. 2.9 (2.6-3.2) mm; thorax 0.9 (0.8-1.0) mm. abdomen 1.9 (1.8-2.2) mm.

Antenna. Preapical seta present 246 (217-278) μm .

Thorax. Shining. Coloration as in the male.

Wings. Transparent, with a pale brownish tint. Length 1757 (1535-1919) μm , width 667 (566-727) μm . Setae: first axillary sclerite with one seta; remigium 1.4 (1-2); squama 6.8 (6-8); vein R 6.4 (5-7); R_1 0.1 (0-1); R_{4+5} 3.3 (2-7). Anal lobe obtuse, not produced.

Legs. Coloration as in the male. There are 9.8 (8-12) sensilla chaetica on basal 1/4-1/3 of mid and 10.4 (8-11) on basal 1/4-1/3 of hind tarsi 1.

Abdomen. Colour pattern different from that of the male. Tergite I yellow, II dark brown with a narrow yellow anterior band, III-IV almost all dark brown but sometimes with very narrow, posterior, yellow band, VII-VIII dark brown generally with anterior, yellowish band on 1/4-1/6. On tergites III-IV median setae not numerous, in double row, generally present only posteriorly; lateral setae not numerous, present on posterior half, uniserial; transverse, incomplete, uniserial row of setae present posteriorly, but not distinctive. Tergal chaetotaxy:

	median setae	lateral setae
Tergite III	1 (1-1)	4.6 (3-6)
Tergite IV	1-4 (1-2)	3.9 (3-4)

Genitalia. Cerci white. Spermathecae dark brown, oval, 111 (96-130) μm long, 64 (52-96) μm wide. Spermathecal ducts strongly S-curved. Lateral sternites of abdominal segment IX well developed.

PUPA

Colour: exuvia brownish, somewhat paler on tergite I. Length of the exuvium about 3 mm, cephalothorax 1 mm abdomen 2 mm.

Cephalothorax. Anterior part of notum very weakly granular along the eclosion line. Pronotal horn pointed, translucent, almost covered by spinules, 184 μm long, 16 μm wide. Prothoracic horn ratio 11.5. Frontal tubercule absent; frontal setae about 40 μm located on prefrons.

Abdomen. Length of anal lobe 360 μm , length of longest anal setae, 288 μm . Pedes spurii B large on abdominal segment II, weakly indicated on segment III. Setae present on abdominal segments I-VII and muscle marks not clearly visible because the specimen is not properly mounted:

	I	II	III	IV	V	VI	VII	VIII
dorsals	3?	?	?	?	5	5	?	?
laterals	1	3	3	3	3	3	3	4
ventrals	?	4?	4?	4?	4	4	?	0

Tergites: I bare; II with few scattered spinules in front of the transverse patch of 36 recurved spines, biserial; III-V with their spine patches fused together laterally and with a median bare area; VII-VIII with a small, shagreen patch anteriorly on each side.

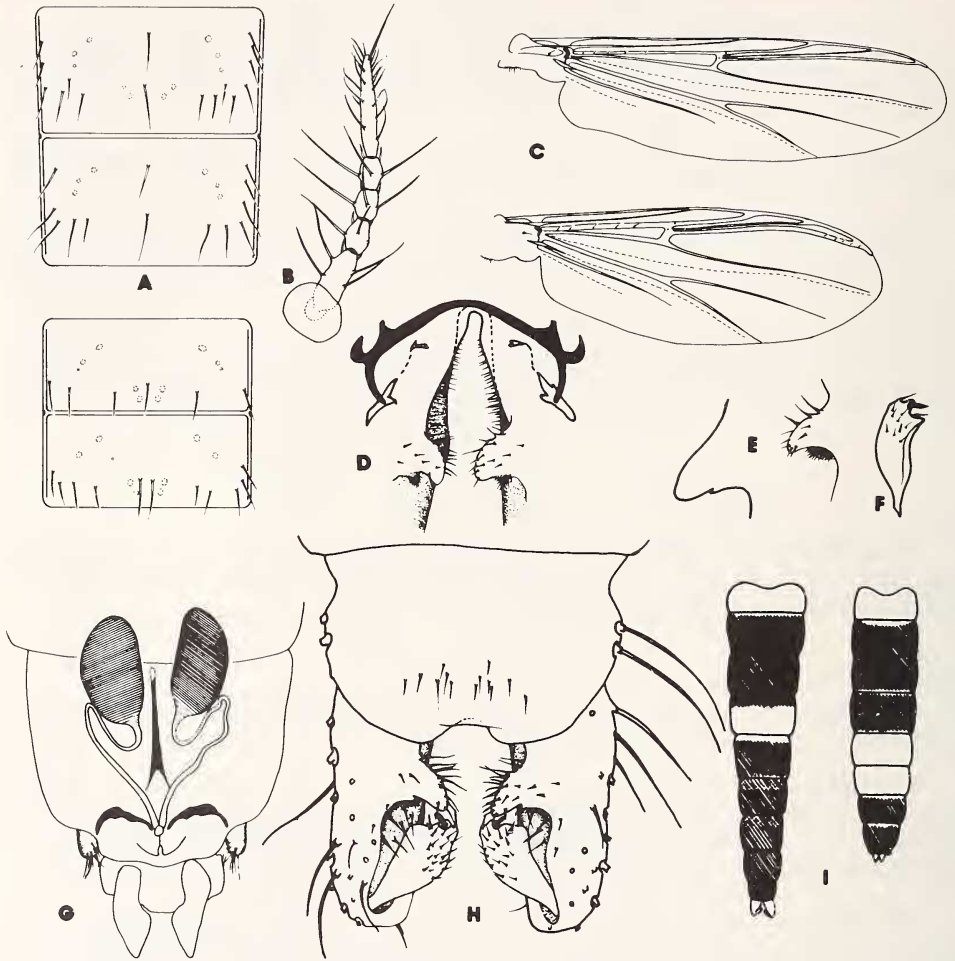


FIG. 15. *Cricotopus festivellus* (Kieffer), imagines. A, chaetotaxy of abdominal tergites III-IV of the male (upper) and the female (lower). B, antenna, female. C, wing, male (upper), female (lower). D, male hypopygium, ventral view. E, basal lobe of gonocoxite, variation. F, gonostylus, variation. G, female genitalia, ventral view (ventral lobe of gonopophysis IX not shown). H, male hypopygium, dorsal view. I, abdominal coloration, male (left), female (right).

LARVA. Unknown.

Remarks. The males of this small, striped, species are very distinctive with abdominal tergites I and posterior 2/3 of IV yellow, and their white hypopygium with large, inner lobe curved backwards. The colour pattern of females is unique among species studied with tergites V-VI yellow. The pupa is distinguished from all others by its large pedes spurii B on abdominal segment II and its spine patches fused together.

Our specimens from Salem Creek are similar to the European species *C. festivellus* (Kieffer) redescribed by Hirvenoja (1973). However, they differ from the latter in several small respects. The colour pattern of the adults is slightly different. In the male, the mean of the antennal ratio is lower than in the European form but ranges overlap, the abdominal chaetotaxy is more reduced. The number of sensilla chaetica on the legs of females is about half the number found in the European specimens and the abdominal chaetotaxy is more reduced in Canadian material. In the pupa examined the prothoracic horn was longer; consequently with a higher ratio than in the European form. All these small differences can be interpreted as normal intraspecific variations in a widely distributed species. However, this opinion could be revised with the discovery of the larvae in North America, and after this species has been studied throughout this continent. This species is reported in Ontario for the first time.

Distribution. Reported from: EUROPE and CANADA, Northwest Territories (Hirvenoja 1973).

Material examined. On slide: ONTARIO, Conestogo, Conestogo River, sweeping along the banks, 6 ♂♂, 24-25.V.1978, Elmira, Salem Creek 3 ♂♂, 2 ♀♀, 18.V-7.IX.1976; 15 ♂♂, 10 ♀♀, 15.V-21.IX.1977; 6 ♂♂, 2 ♀♀, 25.V-1.VI.1978. Waterloo, Laurel Creek, 2 ♂♂, 22.V-27.V.1978. Associated pupa and adult: Green Creek, ONTARIO, 19-22.VI.1967, R.D.M., L.H.-S in the CNC Collection. In alcohol: Elmira, Salem Creek, about 325 ♂♂ and 350 ♀♀ from May 1976 to October 1978.

***Cricotopus (Cricotopus) bicinctus* (Meigen)**

Chironomus bicinctus Meigen, 1818:41 (original description, female).

Cricotopus bicinctus (Meigen), Johannsen, 1905:256 (redescription, male, female); Malloch, 1915:505 (redescription, male, female); Johannsen & Townes, 1952:17 (key, male, female); Roback, 1957a:71 (redescription larva); Darby, 1962:62 (description pupa, larva); Oliver, 1977:98 (comparison with *C. mackenziensis* n. sp.).

Cricotopus (Cricotopus) bicinctus (Meigen), Hirvenoja, 1973:235 (redescription, key, male, female, pupa, larva); Saether, 1977:116 (illustration, female genitalia).

Cricotopus sp. Mason, 1968:83, 1973:83 (illustration, hypostomium, mandible).

MALE (Fig. 16)

Length. 3.4 (3.3-3.7) mm; thorax 1.0 (1.0-1.1) mm; abdomen 2.3 (2.2-2.7) mm.

Thorax. Mesonotal bands, not contrasting on the dark brown ground colour.

Wings. Transparent. Length 1862 (1757-1980) μm , width 614 (566-646) μm .

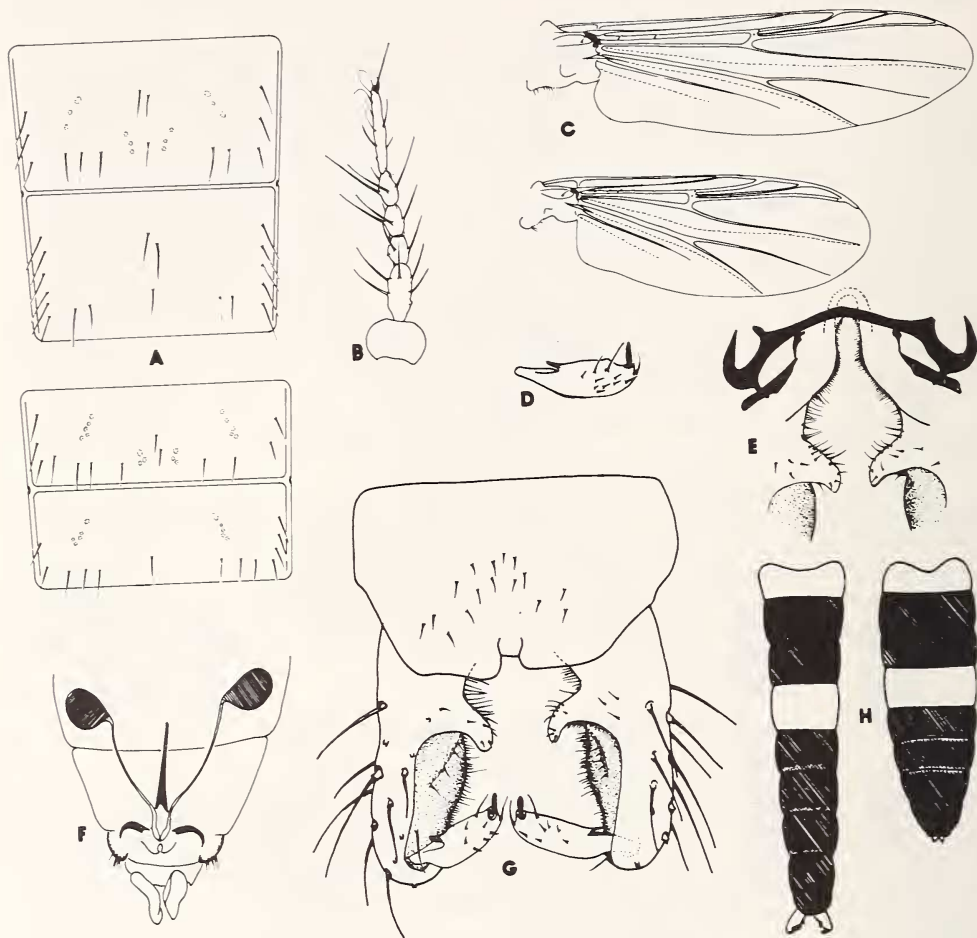


FIG. 16. *Cricotopus bicinctus* (Meigen), imagines. A, chaetotaxy on abdominal tergites III-IV of the male (upper), and the female (lower). B, antenna, female. C, wing, male upper), female (lower). D, male gonostylus, variation. E, male hypopygium, ventral view. F, female genitalia, ventral view. G, male hypopygium, dorsal view. H, abdominal coloration, male (left), female (right).

Setae: first axillary sclerite with one seta; remigium one, squama 9.6 (8-11); vein R 1.5 (0-4) proximal; R_1 0; R_{4+5} 0. Anal lobe moderately roundly produced.

Legs. White ring present on fore tibiae, apical, brown band about three times longer than basal, brown band; yellowish or pale brown ring on mid and hind tibiae. Fore tarsi dark brown; mid and hind tarsi yellowish to pale brown. Sensilla chaetica 9.4 (7-17) only on basal 1/4-2/5 of the hind tarsi 1.

Abdomen. Tergites I and IV white or yellow. Other tergites dark brown, VI-VIII with narrow, more or less distinct, paler posterior band. II with sometimes an anterior yellow narrow band. On tergites III-IV median setae not numerous, uniserial to biserial; lateral setae uniserial; transverse, incomplete, uniserial row of setae present posteriorly. Tergal chaetotaxy:

	median setae	lateral setae
Tergite III	2.7 (2-4)	7.1 (5-13)
Tergite IV	3.4 (2-6)	7.4 (4-12)

Hypopygium. White. Length of gonocoxite 246 (217-278) μm ; length of gonostylus 93 (87-104) μm . Anal point absent. Basal lobe well developed, bent backwards. Inner edge of gonostylus not developed.

FEMALE (Fig. 16)

Length. 2.5 (1.9-2.9) mm; thorax 0.8 (0.6-0.9) mm; abdomen 1.6 (1.3-2.0) mm.

Antenna. Preapical seta present, 59 (55-66) μm .

Thorax. Coloration as in the male but generally paler on the sides and ventrally.

Wings. Transparent. Length 1469 (1293-1616) μm , width 566 (505-626) μm . Setae: first axillary sclerite with one seta; remigium one; squama 7.11 (6-9); vein R 2.6 (1-5) proximal; R_1 0; R_{4+5} 2.0 (1-3) distal. Anal lobe obtuse to rectangularly obtuse.

Legs. Coloration as in the male. There are 12.8 (8-24) sensilla chaetica on basal 1/3-2/5 of mid tarsi 1 and 14 (10-24) on basal 1/3 of hind tarsi 1.

Abdomen. Color of tergites as in the male with tergites I and IV white and others brown. On tergites III-IV, median setae not numerous, uniserial, sometimes biserial; lateral setae uniserial; transverse, incomplete, uniserial row of setae present posteriorly. Tergal chaetotaxy:

	median setae	lateral setae
Tergite III	1.2 (1-2)	2.9 (2-4)
Tergite IV	1.1 (1-2)	2.8 (2-5)

Genitalia. Cerci white. Spermathecae brown, ovoid 73 (61-87) μm long. Spermathecal ducts more or less straight. Lateral sternites of abdominal segment IX, shorter than broad, weakly developed.

PUPA (Fig. 17)

Colour. Exuvia brownish, abdominal segments I, VII-VIII paler; thoracic area darker.

Length. Exuvia 3.7 (3.7-4.1) mm, cephalothorax 2.6 (1.9-2.9) mm, abdomen 1.2 (0.8-1.4) mm.

Cephalothorax. Anterior part of notum coarsely granular along eclosion line. Pronotal horn transparent or pale brown with spinules on the apical half, 165 (148-191) μm long, 34 (26-39) μm wide. Prothoracic horn ratio 5.06 (3.40-7.33). Frontal tubercle absent; frontal setae 143 (102-216) μm , located on the frontal plate above the middle of the base of the antenna.

Abdomen. Anal lobe length 275 (243-313) μm . Length of longest anal seta, 137(113-157) μm . Pedes spurii B large, present on segments II and III. Setae present on abdominal segments I-VIII:

	I	II	III	IV	V	VI	VII	VIII
dorsals	4-5	4-5	4-5	5	5	5	5	1
laterals	1	2-3	3	3	3	3	3	4-5
ventrals	0	3	3	3	4	4	4	0

Tergites: I bare, II with a transverse patch of 69.6 (57-81) recurved, biserial spines and a small, lateral patch of shagreen on each side; III-V with three, spine patches more or less separated or sometimes partly fused in the middle; anterior patch triangular, median and posterior patches transverse, more or less fused on V, a small, shagreen patch present laterally on III-IV; VI with two, spine patches; VII-VIII bare.

LARVA (Fig. 17)

Fourth-instar larva (exuvia) 3.8-6.1 mm long. Head capsule brownish, darker laterally and posteriorly; body greenish, whitish in specimens preserved in alcohol. Anterior eye-spot about 1/3 the size of posterior eye-spot.

Antenna 90 (64-105) mm long, 0.60 (0.50-0.71) as long as mandible, 5.90 (5.13-6.43) times as long as wide. Lauterborn's organs small, antennal blade extending until antennomere 4, accessory seta to antennomere 3 and sensory seta to the end of antennomere 3. Antennal ratio 0.54 (0.43-0.66). Labral setae SI bifurcated. Epipharynx with five chaetulae laterales, and two chaetulae basales; pecten with three setae partly fused at the base.

Premandible simple. Premandibular brush absent. Distal part of the mandible dark brown, inner margin distinctly serrate; dorsal edge smooth or weakly wrinkled.

Hypostomium 131 (109-148) μm wide, 69 (61-80) μm long. Hypostomial ratio 0.52 (0.34-0.61). Median tooth and the first two, lateral teeth paler than the remaining lateral teeth. Median tooth convex, 2.87 (2.25-3.71) as wide as the first, lateral tooth. Second, lateral tooth, reduced, about the size of the first, lateral tooth; lateral teeth 3-6 regularly decreasing in size.

Anal gills sausage-shaped slightly pointed at the end, distinctly rounded. The upper, longer pair, scarcely longer than the pseudopods. Claws on pseudopods dark brown, darker than the brownish claws on anterior prolegs. Lateral hair-tufts on abdominal segments I-VI very small 17 (14-23) μm .

Remarks. *C. bicinctus* is probably the commonest species of this genus and is broadly distributed throughout North America. The colour pattern of the body and the male or female genitalia distinguish adults from other species. In the pupa, the following combination of characters is unique among species studied: pedes spurii B well developed, present on abdominal segment II and III, small, shagreen patch on each side on II, spine patches fused together on V and rough granulation along the eclosion line. The larva is readily separated by the serrate, inner margin

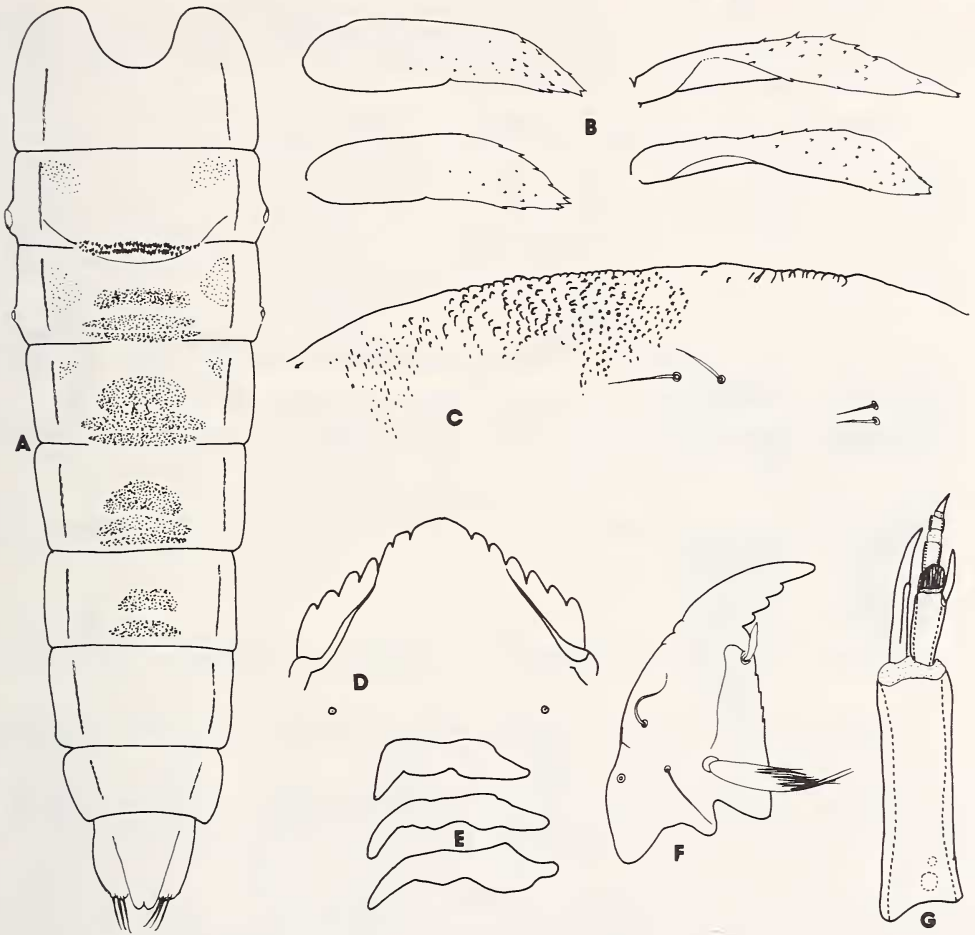


FIG. 17. *Cricotopus bicinctus* (Meigen), pupa A-C, larva D-G. A, ornamentation of pupal exuvia, dorsal view. B, prothoracic horn, variation. C, ornamentation along eclosion line and dorsocentral setae. D, hypostomium, ventral view. E, premandible, variation. F, mandible. G, antenna.

of its mandible and the broad, median tooth of its hypostomium. Recently, Oliver (1977) described a new and closely related species, *C. mackenziensis* with small, frontal tubercles present on the adults. The inner edge of the gonostylus of the male is well developed, two characters absent in *C. bicinctus*. In the pupa, the dorsocentral setae are thicker than those of *C. bicinctus*, black, and placed differently. The larva has a smaller mandible.

Distribution. Reported in CANADA from Yukon to Newfoundland (Oliver 1977; Rosenberg & Wiens 1976; Rosenberg *et al.* 1977) and in United States from CALIFORNIA (Ali & Mulla 1976; Clement *et al.* 1977a,b) to NEW YORK (Johannsen 1905; Sublette & Sublette 1965).

Material examined. On slide: ONTARIO Elmira, Salem Creek, 4 ♂♂, 3 ♀♀, 18.V-22.VI.1976; 14 ♂♂, 9 ♀♀, 17.V-11.X.1977. Associated larva-pupa-adult: Elmira, Canagagigue River Lower East, K. Dance, 27.IV.1976 (1 ♂, 1 ♀), 10.IX.1976 (1 ♂), Upper East 21.VII.1976 (1 ♀), 11.IX.1976 (1 ♀). Elmira, Salem Creek, 19.V.1978 (2 ♂♂), 10.X.1976 (1 ♀), 14.X.1976 (1 ♂). Elmira, Canagagigue River, 10.IX.1976 (1 ♂), 21.V.1978 (1 ♂). In alcohol: Elmira, Salem Creek, about 2375 ♂♂ and 2570 ♀♀ from May 1976 to October 1978.

Cricotopus (Cricotopus) trifascia Edwards

Cricotopus trifascia Edwards, 1929:322 (original description, male).

Cricotopus ithacanensis Sublette, 1967b:555 (original description, male). NEW SYNONYM.

Cricotopus sp., Mason, 1968:85; 1973:85 (illustration, larva).

Cricotopus (Cricotopus) trifascia Edw. Hirvenoja, 1973:244 (redescription, key, adults, pupa, larva).

MALE (Fig. 18)

Length. 4.0 (3.5-4.5) mm; thorax 1.3 (1.1-1.5) mm; abdomen 2.7 (2.3-3.1) mm.

Thorax. Shining. Mesonotal bands contrasting sharply with orange, ground colour, infuscated with brown in darker specimens.

Wings. Transparent. Length 2151 (1838-2343) μm, width 709 (606-788) μm. Setae: first axillary sclerite with one seta; remigium 1.2 (1-2); squama 20.1 (15-26); vein R 3.7 (1-6) proximal: R₁ 0; R₄₊₅ 0. Anal lobe roundly produced.

Legs. Pure white ring on fore tibia with apical, dark-brown band about twice the length of basal, dark band; light ring on mid tibiae white or yellowish, yellowish or pale brown on hind tibiae. Fore tarsi dark brown, mid and hind tarsi brown. Sensilla chaetica 27.1 (16-39) present only on basal 3/7 (1/4-1/2) of hind tarsi 1.

Abdomen. Tergites I, IV yellow, II-III dark brown with anterior 1/6-1/3 and posterior 1/6 yellow, V dark brown with anterior 1/5 yellow and narrow, paler band posteriorly, VI-VIII dark brown, more or less distinctly paler on the anterior 1/5-1/2 and a more or less distinct, paler margin posteriorly. On tergites III-IV median setae not numerous, uniserial; lateral setae numerous and dispersed. Transverse, posterior row of setae not present. Tergal chaetotaxy:

	median setae	lateral setae
Tergite III	2.2 (1-4)	12.2 (5-17)
Tergite IV	3.3 (2-4)	13.6 (10-18)

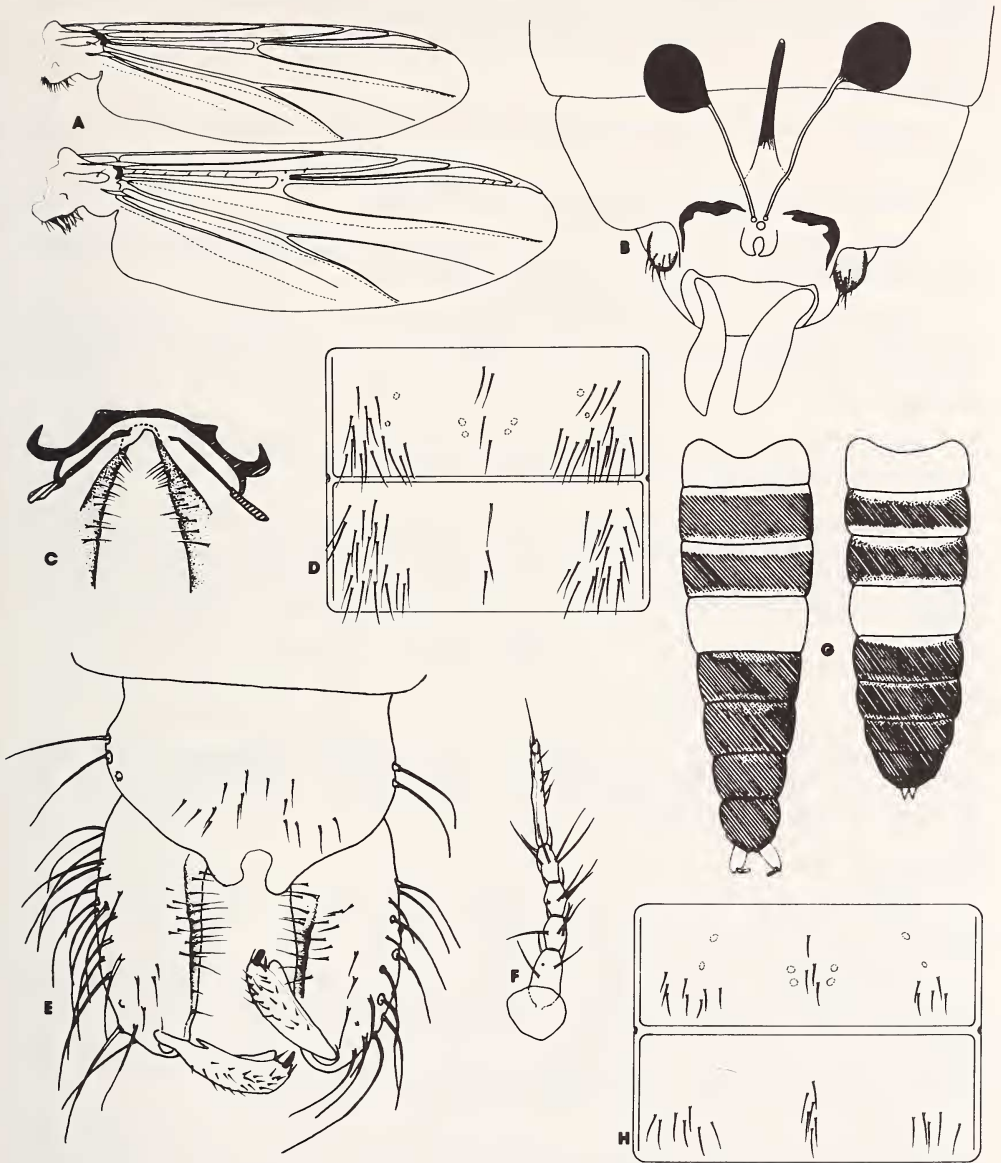


FIG. 18. *Cricotopus trifascia* Edwards, imagines. A, wing, male (upper), female (lower). B, female genitalia, ventral view. C, male hypopygium, ventral view. D, chaetotaxy on abdominal tergites III-IV of the male. E, male hypopygium, dorsal view. F, antenna, female. G, abdominal coloration, male (left), female (right). H, abdominal chaetotaxy of abdominal tergites III-IV of the female.

Hypopygium. Yellow to brownish in some specimens. Length of gonocoxite 259 (226-287) μm , length of gonostylus 112 (104-113) μm . Anal point absent. Posterior margin of tergite IX strongly notched. Basal lobe absent or scarcely indicated. Inner lobe of gonostylus moderately developed.

FEMALE (Fig. 18)

Length. 4.0 (3.7-4.3) mm; thorax 1.4 (1.3-1.5) mm. Abdomen 2.6 (2.4-2.8) mm.

Antenna. Preapical seta present 213 (96-270) μm .

Thorax. Shining. Coloration as in the male but somewhat lighter especially on ventral half of preepisternum II which is pale brown.

Wings. Transparent. Length 2420 (2222-2626) μm , width 893 (788-949) μm . Setae: first axillary sclerite with 1 seta; remigium 1.1 (1-2); squama 23 (18-32); vein R 6.5 (5-9); R_1 0.5 (0-2) proximal; R_{4+5} 3.4 (3-4) distal. Anal lobe rectangular or rounded.

Legs. Coloration as in the male. 35.1 (30-39) sensilla chaetica on basal half of mid tarsi 1 and 46.4 (41-51) on basal half of hind tarsi 1.

Abdomen. Coloration as in the male. Anterior and posterior band on V-VII light yellow rather than pale brown; anterior 1/3-1/2 of VIII often yellow. On tergites III-IV median setae uniserial; lateral setae concentrated in posterior, lateral corners; transverse, posterior row of setae not present. Tergal chaetotaxy:

	median setae	lateral setae
Tergite III	2.5 (1-4)	6.7 (3-11)
Tergite IV	4.5 (2-7)	6.0 (4-9)

Genitalia. Cerci white. Spermathecae dark brown, roundish to oval, 102 (87-122) μm long. Spermathecal ducts nearly straight. Lateral sternites of abdominal segment IX well developed.

PUPA (Fig. 19)

Colour: exuvia brownish. Length of the exuvia (mm): 4.6 (4.0-5.2), cephalothorax 1.5 (1.3-1.7), abdomen 3.1 (2.6-3.5).

Cephalothorax. Anterior part of notum not granular along the eclosion line or ornamentation weakly indicated. Pronotal horn transparent, almost bare 416 (270-565) μm long, 64 (52-78) μm wide. Prothoracic horn ratio 6.45 (3.44-8.13). Frontal tubercule absent; frontal setae 101 (70-148) μm , slender, located on the frontal plate present above the middle of the base of the antenna.

Abdomen. Length of anal lobe 322 (287-348) μm . Internal, anal seta (2 μm thick, 20 μm long) much smaller than two other, large, anal setae (9-10 μm thick) 317 (270-348) μm long. Pedes spurii B present on abdominal segment II. Last lateral setae on segment III-IV plumose, very robust on V-VIII (125-200 μm). Setae present on abdominal segments I-VIII:

	I	II	III	IV	V	VI	VII	VIII
dorsals	3-4	4	5	5	4	4	4	1
laterals	1	3	4	4	4	4	4	4
ventrals	0	2	4	4	4	4	4	0

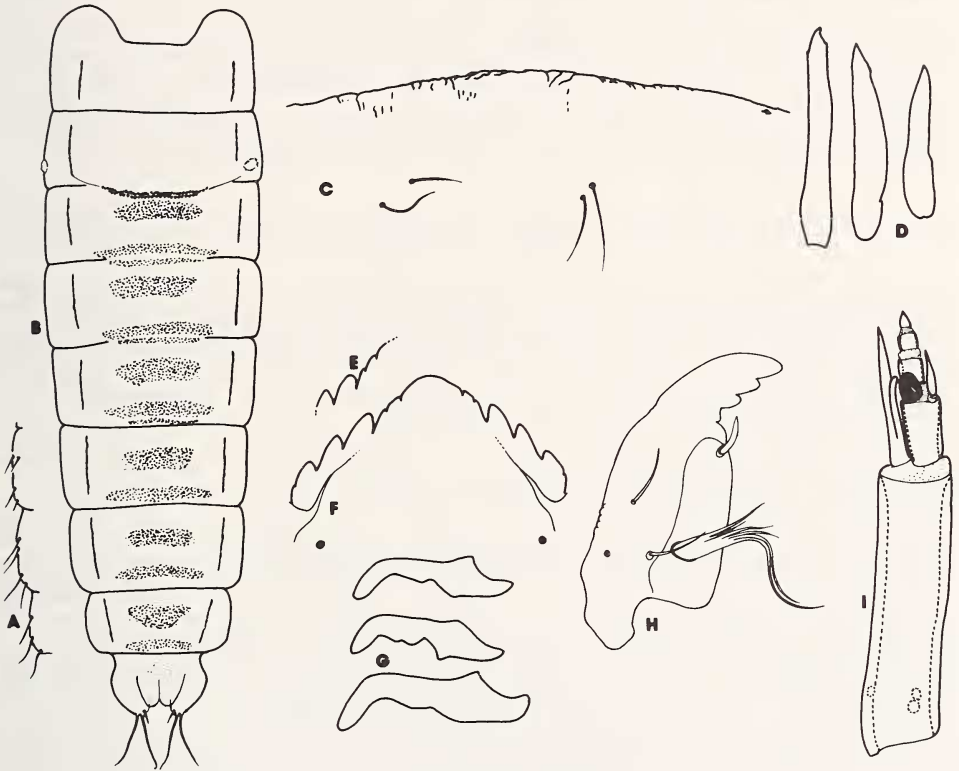


FIG. 19. *Cricotopus trifascia* Edwards, pupa A-D, larva E-I. A, lateral setae on abdominal segments VI-VIII. B, ornamentation of pupal exuvia, dorsal view. C, ornamentation along eclosion line and dorsocentral setae. D, prothoracic horn, variation. E, first lateral teeth, variation. F, hypostomium, ventral view. G, premandible, variation. H, mandible. I, antenna.

Tergites: I bare; II with only a narrow, transverse patch of 113.2 (85-150) recurved spines, biserial, or sometimes with also a very small, spine patch anteriorly; III-V with three, spine patches: anterior patch reniform and well separated from median patch, median and posterior, spine patches narrow, transverse and close to one another; VI-VIII with two, spine patches; anterior patch more or less reniform and separated from posterior, transverse, marginal spine patch.

LARVA (Fig. 19)

Fourth-instar larva (exuvia) 3.5-6.1 mm long. Head capsule brownish, darker laterally and posteriorly. Body greenish.

Antenna 113 (88-127) μm long, 0.66 (0.56-0.81) as long as mandible, 6.46 (5.25-7.38) times as long as wide. Lauterborn's organs large, well developed, antennal blade extending to the base or beyond the antennomere 5, accessory seta to the basal 1/3 of antennomere 3, and sensory seta to the base of antennomere 4. Antennal ratio 0.49 (0.39-0.58). Labral setae SI bifurcated. Epipharynx with five chaetulae laterales and two chaetulae basales; pecten with three large setae.

Premandible simple, brown, generally darker apically. Distal part of the mandible black, inner margin smooth, outer edge with several weak crenulations.

Hypostomium, black 167 (150-186) μm wide, 81 (73-93) μm long. Hypostomial ratio 0.49 (0.43-0.55). Median tooth and first two, lateral teeth indistinctly paler than other lateral teeth (apparent only by transmitted light). Median tooth triangular, first and second lateral teeth fused together and about 1/4 the size of the median tooth, lateral teeth 3-5 triangular, decreasing in size, lateral tooth 6 scarcely indicated, lateral tooth sometimes rounded.

Anal gills sausage-shaped. Claws on anterior prolegs and posterior pseudopods brown. Lateral hair-tufts short, 45 (34-68) μm .

Remarks. This is a large striped species with abdominal tergites I and IV yellow, the others dark brown. The male hypopygium is yellowish and distinctive with basal lobe scarcely indicated. Additional distinctive features found in the females are their large size, the abdominal chaetotaxy, the small spermathecae, and the straight, spermathecal ducts. The pupa was the only one bearing two, spine patches on tergites VII-VIII, robust, lateral setae on V-VIII, almost bare prothoracic horn, and very short, inner, anal seta. The larva is very distinctive because of the following characters: the hypostomium is black with the first, second and sixth lateral teeth very small giving to the hypostomium the appearance of a large, median tooth bordered by three, lateral teeth; the first, antennal segment is very long and the mandible is more elongated than in other species.

The specimens from Salem Creek, as well as the type specimen from New York, correspond with the previously known European species, *C. trifascia* Edwards, and the name *Cricotopus ithacanensis* Sublette is placed in synonymy. The species is reported for the first time in Ontario.

Distribution. Reported from EUROPE (Hirvenoja 1973), and in North America sub *Cricotopus ithacanensis* Sublette from NEW YORK (Sublette 1967b).

Material examined. On slide: ONTARIO, Elmira, Salem Creek 7 δ δ , 22.V-16.X.1976; 13 ♀ ♀ , 10 ♀ ♀ , 1.V-12.IX.1977; 1 δ , 2 ♀ ♀ , 23.V-1.VI.1978. Associated larva-pupa-adults: Elmira, Canagagigue River Upper East, K. Dance. 13.VIII.1976 (1 ♀). Canagagigue River 21.V.1978 (1 δ). L. LeSage. Salem Creek

20.V.1978 (1 ♀), 11.X.1976 (1 ♀), 14.X.1976 (1 ♀), 18.X.1976 (1 ♂); Conestogo, Conestogo River, 17.V.1978 (1 ♂), 19.V.1978 (2 ♂ ♂), 20.V.1978 (1 ♂). In alcohol: Elmira, Salem Creek, about 785 ♂ ♂, 745 ♀ ♀ from May 1976 to October 1978. Originally described as *Cricotopus ithacanensis* Sublette. Holotype male, Ithaca, New York, May 12, 1936; sub-slide S64-1263 located in the Cornell University Collection, ITHACA.

Cricotopus (Isocladius) sylvestris (Fabricius)

Tipula sylvestris Fabricius, 1794:252 (original description, adult).

Cricotopus sylvestris (Fabricius), Malloch, 1915:505 (redescription, key, male); Walley, 1928:22 (key, adult); Johannsen, 1937:52 (key, pupa, larva); Johannsen & Townes, 1952:17 (key, adults); Roback, 1957b:69 (key, pupa, larva); Darby, 1962:62 (description pupa, larva).

Cricotopus (Isocladius) sylvestris (Fab.) Hirvenoja, 1973:277 (redescription, key, adults, pupa, larva); Saether, 1977:116 (illustration, female genitalia).

MALE (Fig. 20)

Length. 3.7 (3.1-4.3) mm; thorax 1.2 (1.1-1.2) mm; abdomen 2.5 (2.0-3.1) mm.

Thorax. Mesonotal bands sharply contrasting on the yellow ground colour, which is sometimes lightly infuscated with brown in front of scutellum.

Wings. Milky transparent. Length 1772 (1636-1980) μm, width 568 (505-626) μm. Setae: first axillary sclerite with one seta; remigium one; squama 16 (13-20); vein R 4.6 (3-7 proximal; R₁ 0; R₄₊₅ 0. Anal lobe moderately produced.

Legs. All tibiae with white ring; basal, brown band larger than apical. Fore tarsi dark brown distinctly darker than mid and hind tarsi; all tarsi 1-2 and basal 3/4 of mid and hind tarsi 3 generally whitish, apical 1/4 of all tarsi 3, and tarsi 4-5 light brown. 17.2 (15-22) sensilla chaetica on basal half of hind tarsi 1. Small pulvilli present.

Abdomen. Tergite I yellow, II-III dark brown with a distinct 1/4 anterior yellow marginal band, IV almost yellow with a round spot in the middle, V dark brown with an anterior yellow marginal band, VI dark brown with pale coloration on posterior 1/3, VII generally yellowish more or less infuscated with brown on anterior 1/3. On tergites III-IV median setae very robust (4-6 μm thick), uniserial; lateral setae weaker (2 μm thick), biserial, triserial sometimes, widely separate; transverse posterior row of setae not present. Tergal chaetotaxy:

	median setae	lateral setae
Tergite III	4.4 (3-6)	8.8 (7-11)
Tergite IV	4.4 (3-6)	13.2 (8-16)

Hypopygium. White. Length of gonocoxite 213 (200-235) μm, length of gonostylus 97 (70-104) μm. Anal point absent. Basal lobe uniramous, directed obliquely backwards, with long, marginal setae. Inner edge of gonostylus well developed, maximum at the base of apical spine which is strong and black.

FEMALE (Fig. 20)

Length. 3.1 (2.4-3.4) mm; thorax 1.2 (0.9-1.3) mm. abdomen 1.9 (1.5-2.1) mm. BR 1.65 (1.56-1.85).

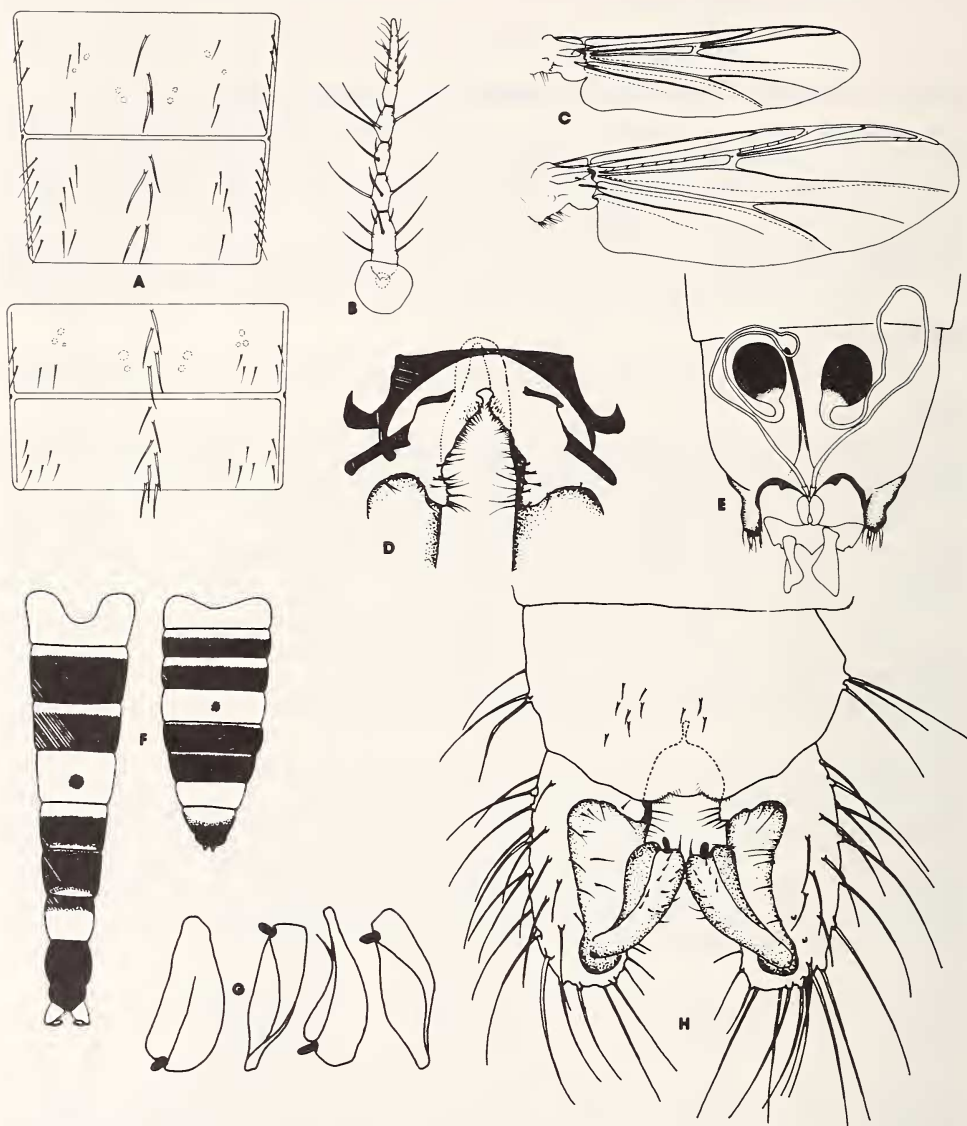


FIG. 20. *Cricotopus sylvestris* (Fabricius), imagines. A, chaetotaxy on abdominal tergites III-IV of the male (upper) and the female (lower). B, antenna, female. C, wing, male (upper), female (lower). D, male hypopygium, ventral view. E, female genitalia, ventral view. F, abdominal coloration, male (left), female (right). G, male gonostylus, variation. H, male hypopygium, dorsal view.

Antenna. Preapical seta absent.

Thorax. Coloration as in the male, but lighter laterally and ventrally.

Wings. Milky, transparent. Length 1880 (1495-2202) μm , width 695 (545-808) μm . Setae: first axillary sclerite with one seta; remigium 1.1 (1-2); squama 16.6 (11-22). vein R 10.2 (8-13); R_1 6 (4-9); R_{4+5} 2.6 (1-6) distal. Anal lobe obtuse, not produced.

Legs. Coloration as in the male. There are 41.4 (30-49) sensilla chaetica on basal 9/10 of mid tarsi 1 and 42.3 (34-51) on basal 9/10 of hind tarsi 1. Small pulvilli present.

Abdomen. Coloration as in the male in general; segment II-III, V-VI with a light anterior margin however, and VII generally completely yellow or white. On tergites III-IV, median setae very robust (4-5 μm) uniserial; lateral setae weaker (2-3 μm) more or less distinctly bi- or triserial; transverse row of setae not present. Tergal chaetotaxy:

	median setae	lateral setae
Tergite III	4.8 (2-7)	4.1 (2-5)
Tergite IV	5.2 (2-8)	5.2 (2-7)

Genitalia. Cerci white. Spermathecae dark brown, roundish 82 (70-104) μm wide, 92 (78-113) μm long, seminal capsule large, paler. Spermathecal ducts strongly looped anteriorly. Lateral sternites of abdominal segment IX well developed.

PUPA (Fig. 21)

(n=2). Colour. Exuvia transparent with a pale yellowish tint. Length of the exuvia (mm) 1.5-2.1, cephalothorax 1.0-1.5, abdomen 0.4-0.6.

Cephalothorax. Largely and strongly granular along the eclosion line. Pronotal horn cylindrical, rounded apically not covered with spinules 191-261 μm long, 17-18 μm wide. Pothoracic horn ratio 11.00-14.28. Frontal tubercule absent. Frontal setae 4-5 μm thick, 227-239 μm long, located on the frontal plate above the middle of the base of the antenna.

Abdomen. Anal lobe length 270-287 μm ; length of the longest anal seta 104-113 μm . Pedes spurii B weak, present on segment II. Setae present on segments I-VIII:

	I	II	III	IV	V	VI	VII	VIII
dorsals	3	4	4	5	5	5	5	2
laterals	1	3	3	3	3	3	3	4
ventrals	1	3	3	4	5	5	5	2

Tergites: I bare, II completely covered by rough shagreen becoming stronger caudad, transverse row of 66, recurved spines: III-V completely covered by rough shagreen mixed with median, spine patch; spine patch along the posterior margin elongated, transverse, and fused more or less distinctly with median, spine patch; VI covered by a large, median, spine patch gradually mixed with shagreen laterally; VII-VIII with shagreen laterally and basally.

LARVA (Fig. 21)

(n=2). Fourth-instar larva (exuvia) 4.0-61 mm long. Head capsule brownish somewhat darker laterally and posteriorly.

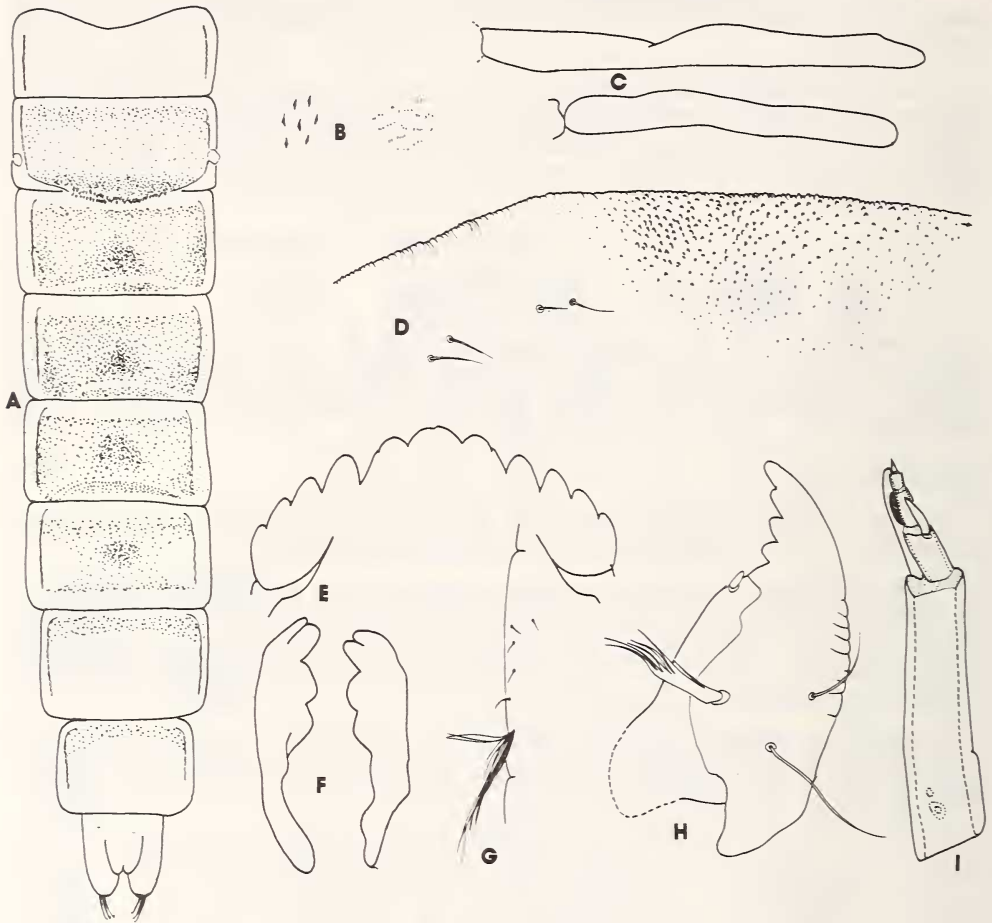


FIG. 21. *Cricotopus sylvestris* (Fabricius), pupa A-D, larva E-I. A, ornamentation of pupal exuvia, dorsal view. B, detail of ornamentation of left, spine patch, on right, shagreen. C, prothoracic horn, variation. D, ornamentation along eclosion line and dorsocentral setae. E, hypostomium, ventral view. F, premandible, variation. G, lateral setae on abdominal segment IV. H, mandible. I, antenna.

Antenna 93-100 μm long, 0.52-0.71 as long as mandible, 5.47-5.50 times as long as wide. Lauterborn's organs large, antennal blade extending to the apex of antennomere 4, accessory seta to basal 1/3 of antennomere 3, and sensory seta to 3/4 of antennomere 3. Antennal ratio 0.47-0.61.

Labral setae SI bifurcated. Epipharynx with two chaetulae laterales and two chaetulae basales; pecten with three large scale-like setae fused at base.

Premandible with two, apical teeth; premandibular brush absent. Distal part of the mandible dark brown to black, inner margin smooth, dorsal edge strongly wrinkled with numerous crenulations. Seta subdentalis 7 μm , short, not reaching the base of the last tooth; setal interna 5 μm finely plumose.

Hypostomium 145-150 μm wide, 61-64 μm long. Hypostomial ratio 0.41-0.44. Median tooth and the first two lateral teeth paler than the remaining teeth. Median tooth convex more or less distinctly notched in the middle. First and second, lateral teeth fused. Lateral teeth 3-6 decreasing regularly in size.

Anal gills sausage-shaped, distally rounded. Pseudopoda claws brown, darker than the pale, brown, anterior, proleg claws. Lateral hair-tufts on abdominal segments I-VI very long 295-318 μm .

Remarks. The large, brightly coloured, striped adults are distinctive with their abdominal segments I, and almost IV and VII yellow and with their abdominal setae uniserial distinctly more robust than lateral setae. Only the larva of this species bears two, apical teeth on the premandible and has very long hair-tufts on abdominal segments I-VI. The pupa is unique with bare cylindrical prothoracic horns, and ornamentation entirely covering tergites II-IV.

The status of specimens from Salem Creek is difficult to establish as they have characteristics shared by *C. trifasciatus* (Meigen), *C. sylvestris* (Fabricus) and *C. remus* Sublette. The adults key out to the small form of *C. trifasciatus* in Hirvenoja (1973), but they bear also a spatulate gonostylus and posterior notopleurals (prealars) of unequal size as in *C. remus* (Sublette 1964). In the pupa, the frontal setae which are 3.5 μm thick, and the small pedes spurii B, present on abdominal segment II, place our specimens in *C. sylvestris*. The apical teeth on the claws of the anterior prolegs of the larva seem about the same size as the lateral teeth, as in the larva of *C. sylvestris*. These features were also observed in the immatures of the paratype of *C. remus* examined; however, the prothoracic horn of its pupa was slightly darker than the rest of the tegument and weak pedes spurii B were present on abdominal tergite III in addition to tergite II. The adults of the *sylvestris*-group are difficult to separate and are extremely variable in their colour pattern. The characters of the immatures, more constant than those found in the imago, refer our specimens either to *C. sylvestris* or *C. remus*. However, the first name is used here as it reflects the wide distribution of the species. Future studies throughout North America will probably show that specimens referred to *C. remus* can be considered as members of this circumboreal species and that the small differences observed can be attributed to geographical variations.

Distribution. Reported from EUROPE (Hirvenoja 1973); and in North America from CALIFORNIA (Ali & Mulla 1976; Clement *et al.* 1977a,b; Grodhaus 1963, 1968) to NEW YORK (Johannsen 1937; Johannsent & Townes 1952).

Material examined. On slide: ONTARIO: Elmira, Salem Creek, 5 δ δ , 2 f f , 10.VI-4.VIII.1976; 1 δ , 9 f f , 24.V-29.VI.1977. Waterloo, at blacklight in a field, 8 δ δ , 5 f f , 21.VI-30.VI.1976. Conestogo, Conestogo River, 2 δ δ , 1 f ,

23-27.V.1978. Associated larva-pupa-adult: Elmira, Canagagigue River Upper East, K. Dance, 12.VII.1976 (1 ♀), 16.VIII.1976 (1 ♀). In alcohol: Elmira, Salem Creek, about 25 ♂ ♂ and 150 ♀ ♀ from May 1976 to September 1978.

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References

- ALI, A. and M. S. MULLA. 1976. Insecticidal control of chironomid midges in the Santa Ana River water spreading system, Orange County, California. *J. econ. Ent.* **69**: 509-513.
- BATH, J. L. and L. D. ANDERSON. 1969. Larvae of seventeen species of chironomid midges from southern California (Diptera). *J. Kans. ent. Soc.* **42**: 154-176.
- BECK, E. C. and W. M. BECK. 1959. A checklist of the Chironomidae (Insecta of Florida (Diptera: Chironomidae)). *Bull. Fla. St. Mus. biol. Sci.* **4**: 85-96.
- BECK, W. M. 1977. Environmental requirements and pollution tolerance of common freshwater Chironomidae. Environmental Protection Agency, Environmental Series, Publication No EPA-600/4-77-024: 1-261.
- CLEMENT, S. L., A. A. GIGARICK, and M. O. WAY. 1977a. The colonization of California rice paddies by chironomid midges. *J. appl. Ecol.* **14**: 379-389.
- . 1977b. Conditions associated with rice plant injury by chironomid midges in California. *Env. Ent.* **6**: 91-96.
- COQUILLET, D. W. 1902. New Diptera from North America. *Proc. U.S. natn. Mus.* **25**: 83-126.
- CURRAN, C. H. 1929. New Diptera in the American Museum of Natural History. *Am. Mus. Novit.* **339**: 1-13.
- CURRY, L. L. 1965. A survey of environmental requirements for the midges (Diptera: Tendipedidae) in: Biological Problems in Water Pollution. *U.S. Pub. Health Serv. Publ.* No. 99-WR-25: 127-144.
- DARBY, R. E. 1962. Midges associated with California rice fields, with special reference to their ecology (Dipt., Chir.). *Hilgardia* **32**: 1-206.
- DENDY, J. S. and J. E. SUBLETTE. 1959. The Chironomidae of Alabama with descriptions of six new species. *Am. ent. Soc. Am.* **52**: 506-519.
- EDWARDS, F. W. 1929. British non-biting midges (Diptera: Chironomidae). *Trans. R. ent. Soc. Lond.* **77**: 279-430.

- FABRICIUS, J. C. 1874. *Entomologia systematica emendata et aucta*—IV. pp. 472, Hafniae.
- GOETGHEBUER, M. 1927. Les *Cricotopus* de Belgique (Dipt. Chironomides). *Bull. Ann. Soc. ent. Belg.* **67**: 51-54.
- GRODHAUS, G. 1963. Chironomid midges as a nuisance. III. The nature of nuisance and remarks on its control. *Cal. Vec. Views* **10**: 27-37.
- . 1968. Considerations in controlling Chironomids. *Proc. Pap. 36th annu. Conf. Cal. Mosq. Cont. Ass.* **36**: 37-39.
- HANSEN, D. C. and E. F. COOK. 1976. The systematics and morphology of the nearctic species *Diamesa* Meigen, 1835 (Diptera: Chironomidae). *Mem. Am. ent. Soc.* **30**: 1-203.
- HIRVENOJA, M. 1973. Revision der Gattung *Cricotopus* van der Wulp und ihrer Verwandten (Diptera: Chironomidae). *Annl. Zool. Fenn.* **10**: 1-363.
- JOHANNSEN, O. A. 1905. Aquatic nematoceros Diptera. In: Needham, I. G., Morton, K. I., Johannsen, O. A. (eds.): May flies and midges of New York. *Bull. N.Y. St. Mus.* **86**: 76-327.
- . 1908. New North American Chironomidae. In: Felt, E.P. (ed.): 23 report of the State Entomologist on injurious and other insects of the State New York, 1907. *Bull. N.Y. St. Mus.* **124**: 264-285.
- . 1937. Aquatic Diptera III. Chironomidae: Subfamilies Tanypodinae, Diamesinae and Orthocladiinae. *Mem. Cornell Univ. agri. Exp. Stn.* **210**: 3-84.
- . 1942. Immature and adult stages of new species of Chironomidae (Diptera). *Ent. News* **53**: 70-77.
- . 1943. Adult and immature stages of *Cricotopus elegans* n. sp. *Ent. News* **54**: 77-79.
- JOHANNSEN, O. A. and H. K. TOWNES. 1952. Diptera of Connecticut-Tendipedidae (Chironomidae) in: Troxell E. L. (ed.): Guide to the insects of Connecticut VI. *Bull. Conn. St. geol. nat. Hist. Surv.* **80**: 1-147.
- KIEFFER, J. J. 1906. Diptera Fam. Chironomidae. In: Wytzman, P. (ed.), *Genera Insectorum* **42**: 1-78.
- LESAGE, L. 1979. Taxonomy and ecology of *Cricotopus* species from Salem Creek, Ontario (Diptera: Chironomidae). Ph.D. Thesis, University of Waterloo. pp. 368.
- LESAGE, L. and A. D. HARRISON. 1980. The biology of *Cricotopus* (Chironomidae: Orthocladiinae) in an algal-enriched stream: Part I. Normal biology. *Arch. Hydrobiol./Suppl.* **58**: 1-25.
- MACQUART, M. 1826. Insectes Diptères du nord de la France. Tipulaires. Société d'amateurs des sciences, de l'agriculture et des arts à Lille, recueil des travaux. 1823/1824: 52-224.
- MALLOCH, J. R. 1915. The chironomidae or midges of Illinois, with particular reference to the species occurring in the Illinois River. *Bull. Ill. St. Lab. nat. Hist.* **10**: 275-543.
- MASON, W. T. 1968. An introduction to the identification of chironomid larvae. *U.S. env. Prot. Ag. Cincinnati, Ohio.* 90 pp.
- MEIGEN, J. W. 1818. Systematische Beschreibung der bekannten europäischen zweiflügeligen Insekten. Erster Theil. Aachen, XXXVI + 333 pp.
- OLIVER, D. R. 1962. A review of the subfamily Orthocladiinae (Chironomidae, Diptera) of Bear Island. *Astarte* **20**: 1-19.
- . 1977. *Bicinctus*-group of the genus *Cricotopus* Van der Wulp (Diptera: Chironomidae) in the Nearctic with description of a new species. *J. Fish. Res. Bd. Can.* **34**: 98-104.
- PACKARD, A. S. 1869. On insects inhabiting salt-water. *Proc. Essex Inst.* **6**: 41-51.
- PATRICK, R., J. CAIRNS, and S. S. ROBACK. 1967. An ecosystematic study of the fauna and flora of the Savannah River. *Proc. Acad. nat. Sci. Phila.* **118**: 109-411.

- ROBACK, S. S. 1957a. The immature tendipedids of the Philadelphia area (Diptera: Tendipedidae). *Monogr. Acad. Nat. Sci. Phila.* **9**: 1-152.
- . 1957b. Some Tendipedidae from Utah. *Proc. Acad. Nat. Sci. Phila.* **109**: 1-24.
- . 1974. Insects (Arthropoda: Insecta). In: Hart, C. W. and Fuller, S. L. H. (eds.): Pollution ecology of freshwater invertebrates, pp. 313-376. Academic Press, New York, London.
- ROSENBERG, D. M. and A. P. WIENS. 1976. Community and species responses of Chironomidae (Diptera) to contamination of fresh waters by crude oil and petroleum products with special references to the Trail River, Northwest Territories. *J. Fish. Res. Bd. Can.* **33**: 1955-1963.
- ROSENBERG, D. M., A. P. WIENS, and O. A. SAETHER. 1977. Life history of *Cricotopus (Cricotopus) bicinctus* and *C. (C.) mackensiensis* (Diptera: Chironomidae). *J. Fish. Res. Bd. Can.* **34**: 247-253.
- ROUSSEL, M. E. 1978. Technique for mounting chiromids in Canada Balsam: an adaptation of Leo Forster's Technique. Unpublished manuscript, 2 pp.
- SAETHER, O. A. 1967. Notes on some nearctic chironomid larvae. *Ent. News* **78**: 197-208.
- . 1971. Four new and unusual Chironomidae (Diptera). *Can. Ent.* **103**: 1237-1260.
- . 1977. Female genitalia in Chironomidae and other Nematocera: morphology, phylogenies, keys. *Bull. Fish. Res. Bd. Can.* **197**: 1-209.
- SAY, T. 1823. Descriptions of dipterous insects of the United States. *J. Acad. nat. Sci. Phila.* **6**: 149-178.
- SOPONIS, A. R. 1977. A revision of the nearctic species of *Orthocladius (Orthocladius)* Van der Wulp. (Diptera: Chironomidae). *Mem. ent. Soc. Can.* **102**: 1-187.
- SUBLETTE, J. E. 1964. Chironomidae (Diptera) of Louisiana 1. Systematics and immature stages of some lentic chironomids of west-central Louisiana. *Tulane Stud. Zool.* **11**: 109-150.
- . 1966a. Type specimens of Chironomidae (Diptera) in the American Museum of Natural History. *J. Kans. ent. Soc.* **39**: 1-32.
- . 1966b. Type specimens of Chironomidae (Diptera) in the U.S. National Museum. *J. Kans. ent. Soc.* **39**: 580-607.
- . 1967a. Type specimens of Chironomidae (Diptera) in the Canadian National Collection, Ottawa. *J. Kans. ent. Soc.* **40**: 290-331.
- . 1970. Type specimens of Chironomidae (Diptera) in the Illinois Natural History Survey Collection, Urbana. *J. Kans. ent. Soc.* **43**: 44-95.
- SUBLETTE, J. E. and M. S. SUBLETTE. 1965. Family Chironomidae (Tendipedidae). A catalog of the Diptera of America, north of Mexico. *U.S. Dept. Agric. Handbook* **276**: 142-181.
- . 1971. The Orthocladiinae (Chironomidae: Diptera) of California I. The *Cricotopus infuscatus* group. *Ent. News* **82**: 85-102.
- WALLEY, C. S. 1928. A new species of *Cricotopus* with a key to the genus (Diptera: Chironomidae). *Can. Ent.* **60**: 21-22.
- WIRTH, W. W. 1957. The species of *Cricotopus* midges living in blue-green algae *Nostoc* in California (Diptera: Tendipedidae). *Pan-Pac. Ent.* **33**: 121-126.

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